

# Motorship

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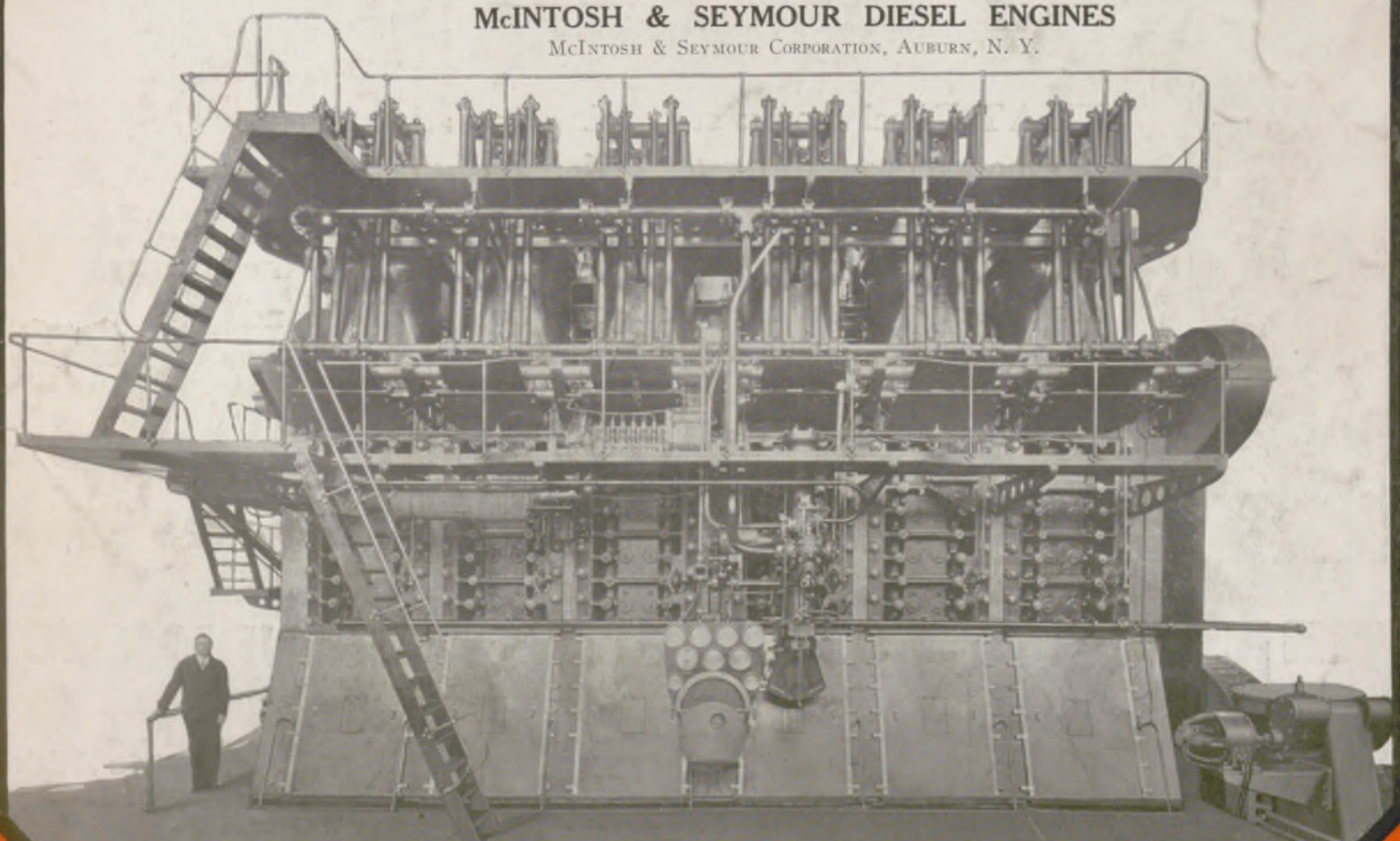
## 2700-B.hp.—The largest four-stroke-cycle Diesel Engine built in America

THE first of three similar units completed for U. S. Shipping Board. The tests completely met the guarantees and the performance was all that could be asked.

For top-notch economy and efficiency and care-free service, you can depend upon

**McINTOSH & SEYMOUR DIESEL ENGINES**

McINTOSH & SEYMOUR CORPORATION, AUBURN, N. Y.



Volume XI, No. 6

JUNE, 1926

Price, 35 Cents

ARTICLES on design, construction and operation of oil-engines and motorships by the world's foremost writers on marine engineering.

# Motorship

ILLUSTRATIONS of the newest designs in international merchant motorship and Diesel-engine construction and auxiliary equipment.

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Vol. XI

June, 1926

No. 6

## Test of Big McIntosh & Seymour Engine

Record 6-Cylinder 2700 s.hp. Single-Acting 4-Cycle Set Successfully Completes Official 30-Day Full Power Trial for the United States Shipping Board

WITH the ending of the 30-day non-stop full-power run by the 3260 i.hp. Diesel engine recently built at Auburn by the McIntosh & Seymour Corporation for the United States Shipping Board, additional impetus has been given to the forward progress of motorship conversion.

Many Diesel engines in commercial service habitually make longer runs than this, and the chief interest of the performance lies in the fact that it was accomplished with an engine holding a record for size in

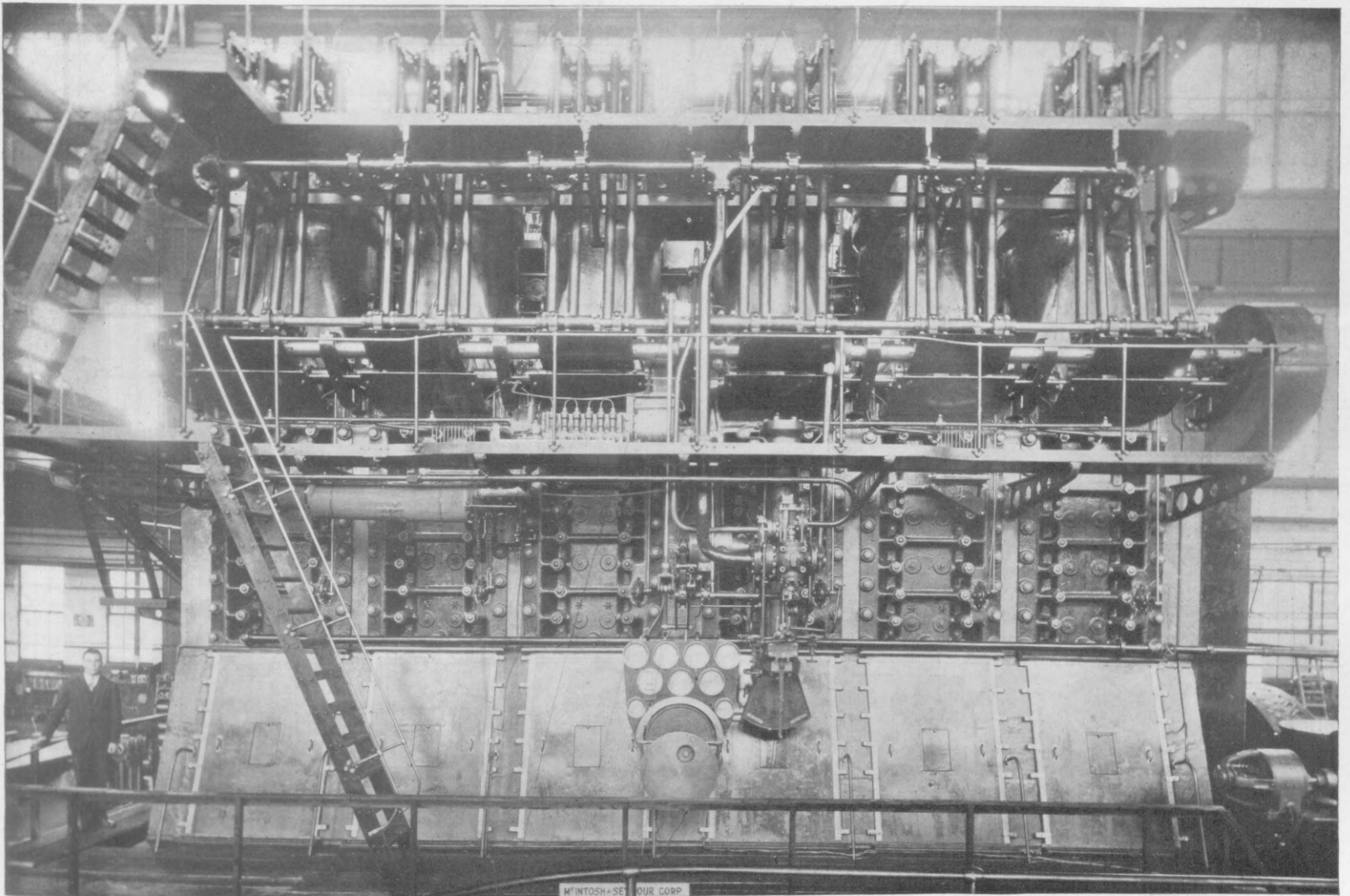
the United States. A hardship of the test was the fact that the average temperature of the cooling water did not rise far above the freezing point and is stated to have hovered around 35 deg. F. As a result thereof the exit temperature of the water never rose much beyond 100 deg. F. in spite of the fact that it was throttled down to the limit of safety. To reduce the cooling water supply much beyond that corresponding to the exit temperature stated was deemed inadvisable, because of the danger that certain

parts of the cooling system might not be filled and that overheating could result from the formation of air pockets.

### Chief Characteristics of Main Engine

Indicated power .....	3260 i.hp.
Shaft power .....	2700 s.hp.
Number of cylinders .....	6
Bore .....	32 in.
Stroke .....	60 in.
Speed .....	95 r.p.m.
Weight .....	800,000 lb.

The relatively slight difference between



In this 2700 b.hp. engine for the Shipping Board the cylinders are of 32 inches diameter, a record for 4-cycle single-acting practice

indicated and brake horsepower is due to the use of separate injection air compressors independently driven by Diesel engines. The engine is by far the largest commercial 4-cycle single-acting machine ever completed in America, both in respect to cylinder dimensions and capacity. This fact, and the circumstance that all the interior parts, upon being laid open for inspection after the 30-day run, showed what is regarded as an exceptionally good appearance, accounts for the widespread interest evinced by engineers. The fuel consumed on the test was of considerably lower grade than that commercially used in Diesel engines and is therefore claimed to underscore the excellent results reported.

The tank car lots were uneven in quality, there was no provision for mechanically mixing them after arrival and the near zero weather apparently kept them stratified after they were discharged into the storage tank. One of the worst analyses on a mixed sample taken from top, middle and bottom of a tank car showed—

#### Analysis of One Tank Car Lot

Beaumé at 60 deg. F. ....	19.3 deg.
Flash point .....	189 deg. F.
Fire point .....	215 deg. F.
Water .....	0.5 per cent
Sulphur .....	4.5 per cent

Viscosity, Furol (at 77 deg. F.)... 80 seconds  
Heat value—high ..... 18,300 B.t.u. per lb.  
Heat value—low ..... 17,019 B.t.u. per lb.

For hours on end the engine had to run on just such fuel. Then a superior lot of oil would feed through. The average of the whole shipment does not therefore indicate the severity of the test. Had the fuel been uniform in the tank car lots the engine trial would have been less searching. The official average analysis shows—

#### Average Analysis of Fuel Used

Beaumé at 60 deg. F. ....	21 deg.
Flash point .....	189 deg. F.
Fire point .....	215 deg. F.
Water .....	0.15 per cent
Sulphur .....	2.21 per cent
Viscosity, Furol (at 77 deg. F.)... 60 seconds	
Heat value—high ..... 18,360 B.t.u. per lb.	
Heat value—low ..... 17,700 B.t.u. per lb.	

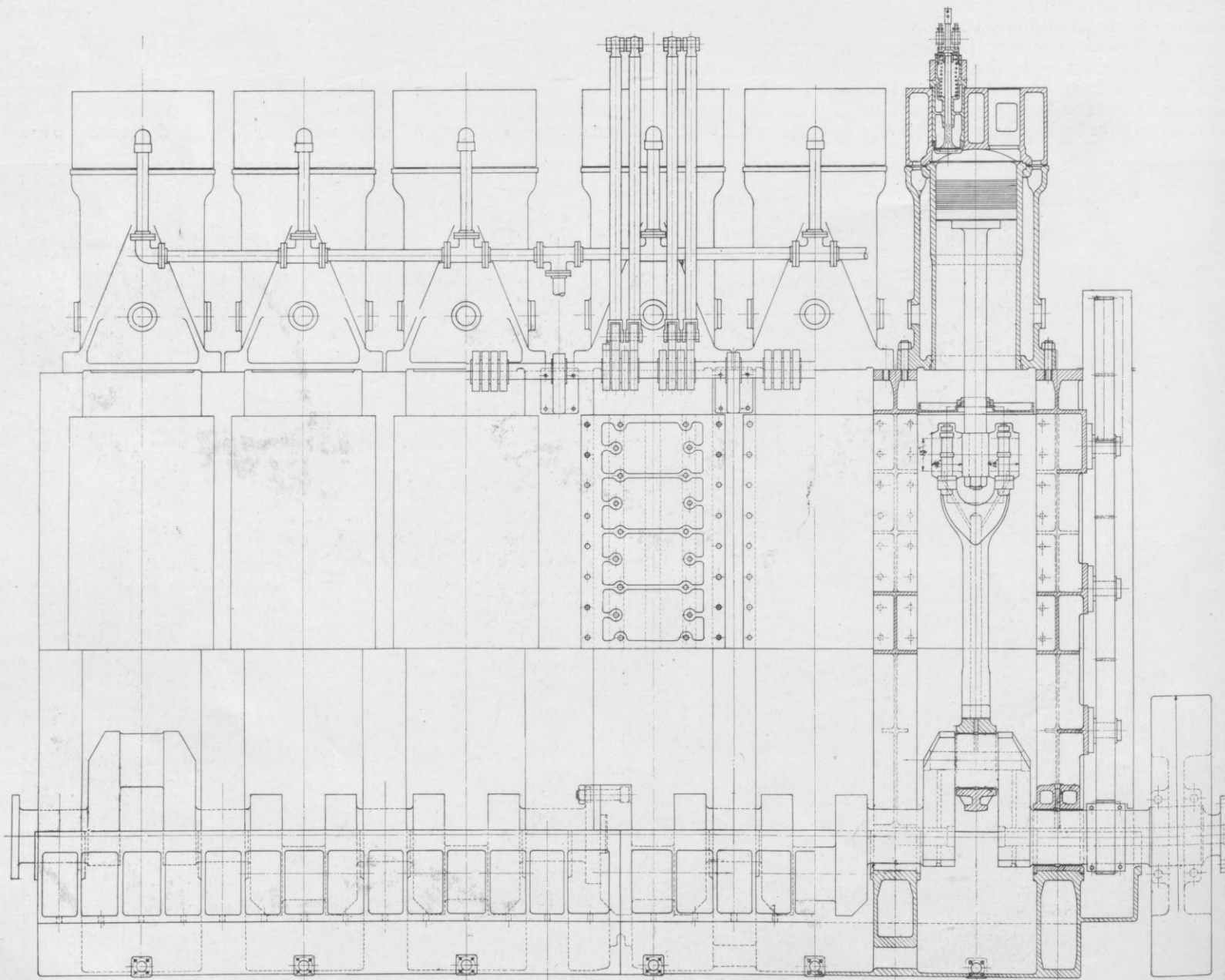
In its main outlines the engine does not depart markedly from the characteristic McIntosh & Seymour design, well known to both marine and stationary users of Diesel engines in the United States. The bed-plate is of the usual deep trough construction, consisting of two sections planed and flanged together in such a way as to form a continuous rigid member. In the course of its manufacture the planing and drilling are carried out prior to boring the main

bearing recesses and caps, for which the great boring bar is supported in special steady-rests spanning the crankpits and bolted against the planed surfaces, a procedure which automatically and positively insures alignment.

The A-frames astride the main bearings are noteworthy because they are made of cast steel. As they are of the open-web design their thickness and soundness can everywhere be checked, while the danger of core-shifting, sometimes regarded as a liability with hollow columns, is of course eliminated. Because of their great inherent strength the cast steel columns have rendered the use of tie-rods superfluous.

The frames have a tapered contour for only about half their height, the extreme width at the bottom corresponding to the breadth of the crankpits and the height of the crotch being such as to give ample working clearance above the main bearing caps. Above the crotch, however, the contour of the frames is straight, a fact which is taken advantage of to produce a structure possessing characteristic box-frame rigidity.

On the operating side the upper straight contours of the A-frames are joined by the massive crosshead guide plates in such a way as to form a continuous vertical wall, 7 ft. in depth, running for the entire length



*Elevation of the 2700 b.h.p. McIntosh & Seymour 4-cycle single-acting engine, with one cylinder line in longitudinal section*

of the engine. On the outboard side they are joined by almost equally massive plates offering support for the piston cooling tubes.

The net effect of the guide plates and tie plates joining the upper parts of the A-frames together is to produce a massive box-girder effectively supplementing the strength of the bedplate. In fact, if the relative shortness of the A-frame portions between the bedplate surface and the box-frame be taken into account, the two members themselves might be regarded as forming a girder together. In that case the entire engine from the cylinder flanges down would form a single structure possessing almost unlimited stiffness. While it is highly desired for stationary work, this feature has come to be regarded as indispensable for marine engines. By no other means, it is said, can the alignment of the moving parts be preserved in all weathers and conditions of hull deflections.

Flanges on the water jackets of the working cylinders connect them rigidly to the box-frame built up of longitudinal walls and transverse A-frame webs. As the contours of the cylinder flanges are rectangular, the

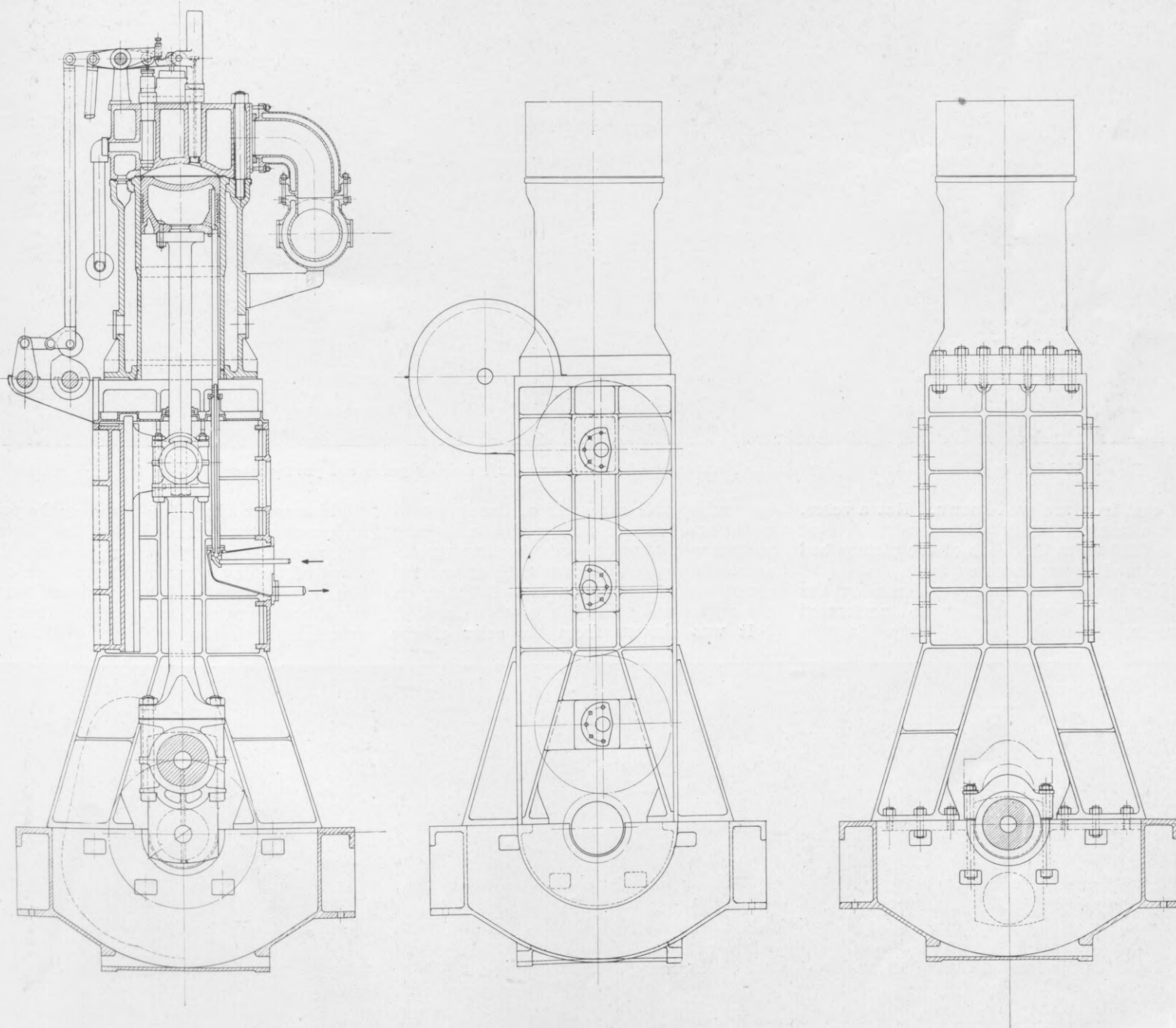
bolts in opposite (fore and aft) sides of them can be run through the top flanges of the cast-steel A-frames, to which they transmit stress in the directest possible manner down to the main bearing girders in the bedplate.

Separate cylinder liners are inserted in the water-jackets according to the usual practice, projecting through rubber joints permitting the endwise movement due to expansion. Just below the end of the cylinder liner is a continuous pan or diaphragm which seals off the crosshead and other moving parts. Combustion residues dropping from the cylinder are positively prevented from fouling the main force feed lubricating oil system; the piston rod works in a light gland and does not offer any possibility for combustion muck to get by. Sheet metal deflectors further serve to guide any splash of oil or water possibly occurring in the space immediately beneath the cylinders into the same cast iron pan. Piston cooling gear consisting merely of packed bronze tubes is also conveniently mounted on the pan. Stationary guard tubes surrounding the moving ones, but having no contact with them, extend downward from the pan as far

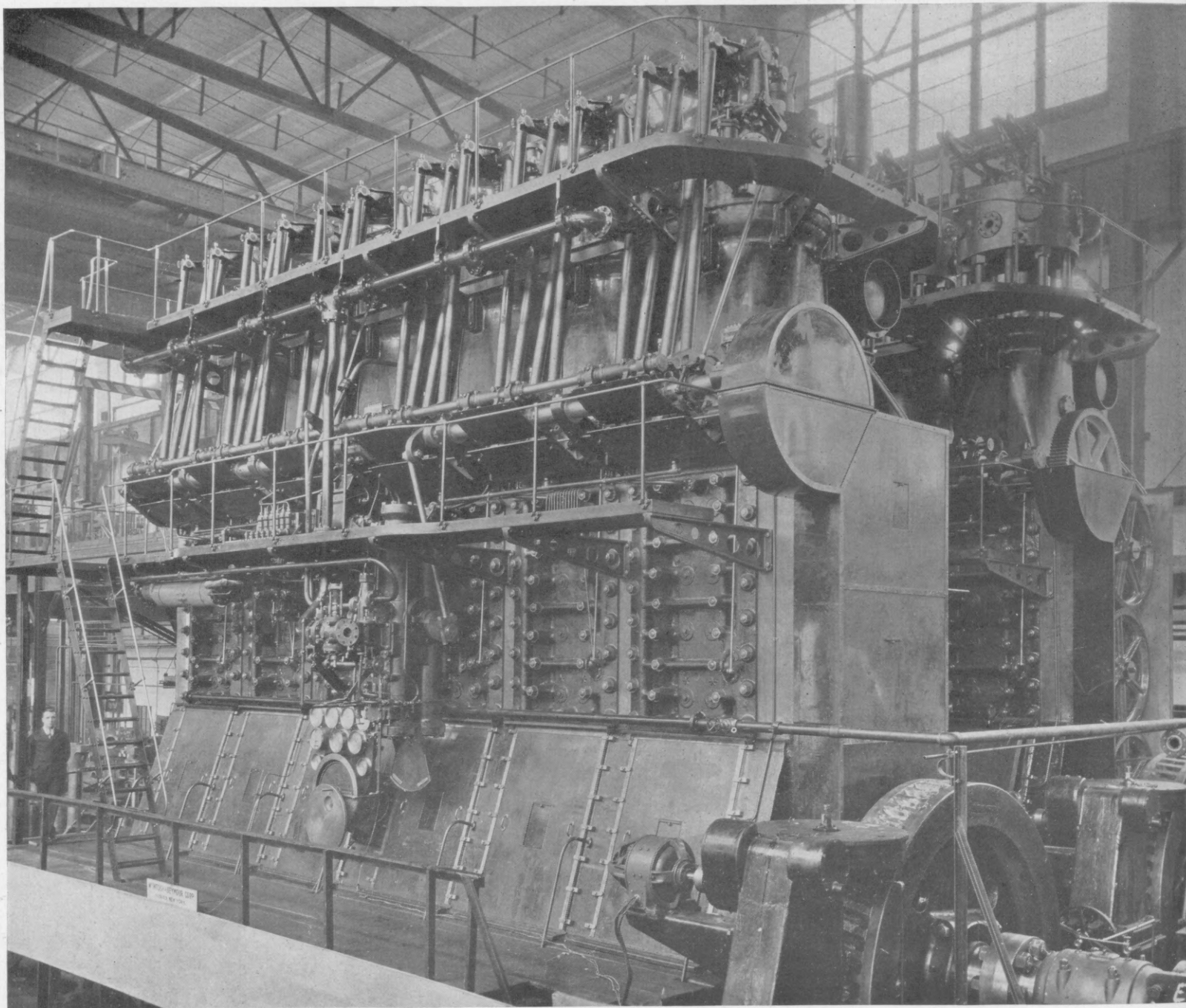
as a special pocket cast on the tie plates previously referred to. As the guard tubes are flanged absolutely water-tight both to the top of the pocket and to the underside of the pan, leakage of piston cooling water into the crankcase is rendered physically impossible. Both the piston cooling supply and the sight drain returning from the pistons is visible within the pocket, which faces to the back of the engine.

A special grade of cast iron used in the liners has made it possible to reduce their wall thickness, which does not appear to be very much more than that found on cylinders of smaller bore. A sample of this iron was turned, threaded, and bored in such a manner as to produce the cast iron spring shown in the view on p. 442. So close is the grain of this metal and so resilient its character, that engineers who handle the springs do not suspect their being made of anything else than spring material.

This impression is further reinforced by the appearance of cylinder bores as they were observed immediately after the 30-day run was ended. The polish found was unblemished and had a higher, more silky lustre than that for which the usual grades



*Transverse sections and end view of the 6-cylinder 2700 b.h.p. 4-cycle single-acting McIntosh & Seymour engine for the Shipping Board*



*Two 2700 b.h.p. engines on the test floor at the Auburn works. The camshaft driving gears are partly uncovered on the rear engine*

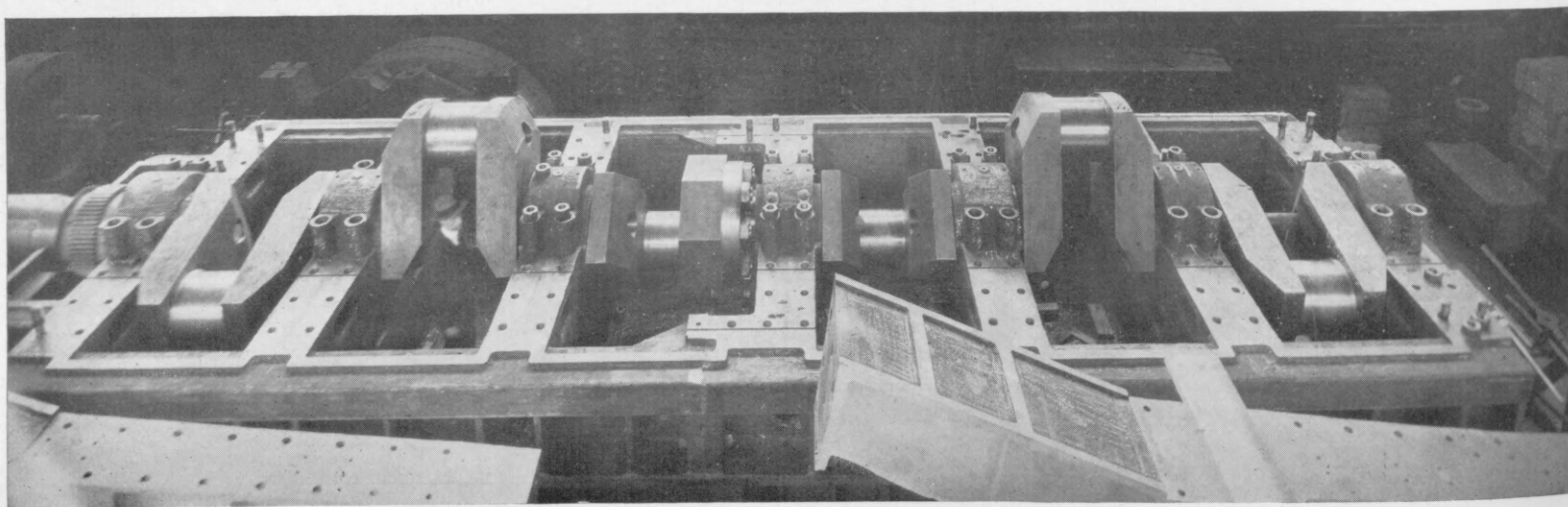
of cast iron are well-known. Not a score, not a scratch, barely a discoloration told of the 7800 miles that each of the pistons had traversed across these surfaces.

Nor was there much evidence on the pistons to show that they had performed any more than their normal duty. In fact,

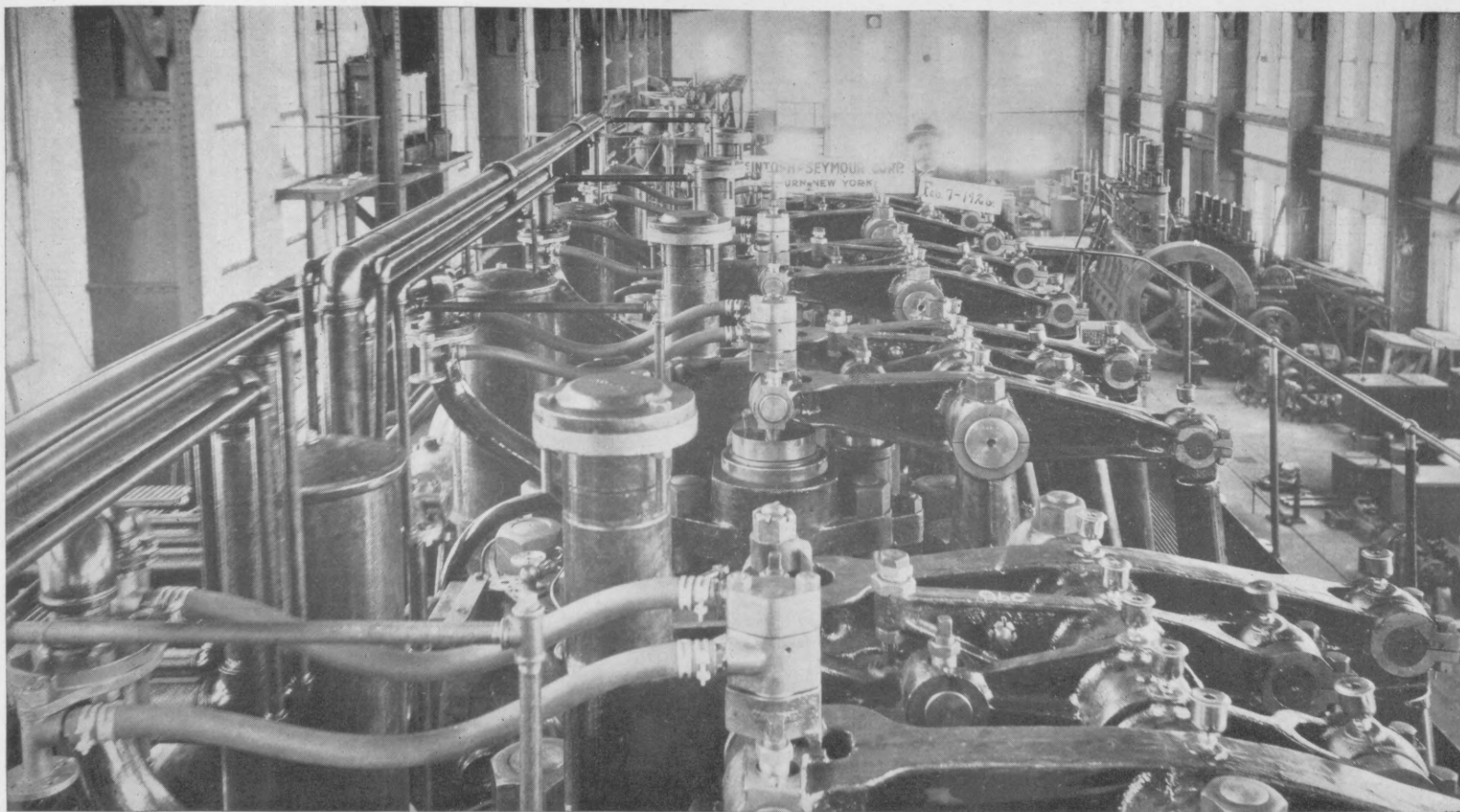
the unfavorable character of the fuel used would have justified the expectation that the pistons would have a corresponding appearance. However, there was nothing unusual about the slight carbon deposit found on the crowns and above the topmost rings.

It was obvious from the color of the

slight amount of residue found on the pans underneath the cylinders that the pistons had been practically free from blowing. Instead of finding the usual lamp-black carbon, characteristic of leaky piston conditions, observers state that nothing but the greenish lubricating oil muck was visible.



*A man standing in the crankpit helps to convey a relative idea of the dimensions of the baseplate, main bearings and crankshaft*



*Valve arrangements, and notably the watercooling connections for the exhaust valves, are shown in this view of the top of the engine*

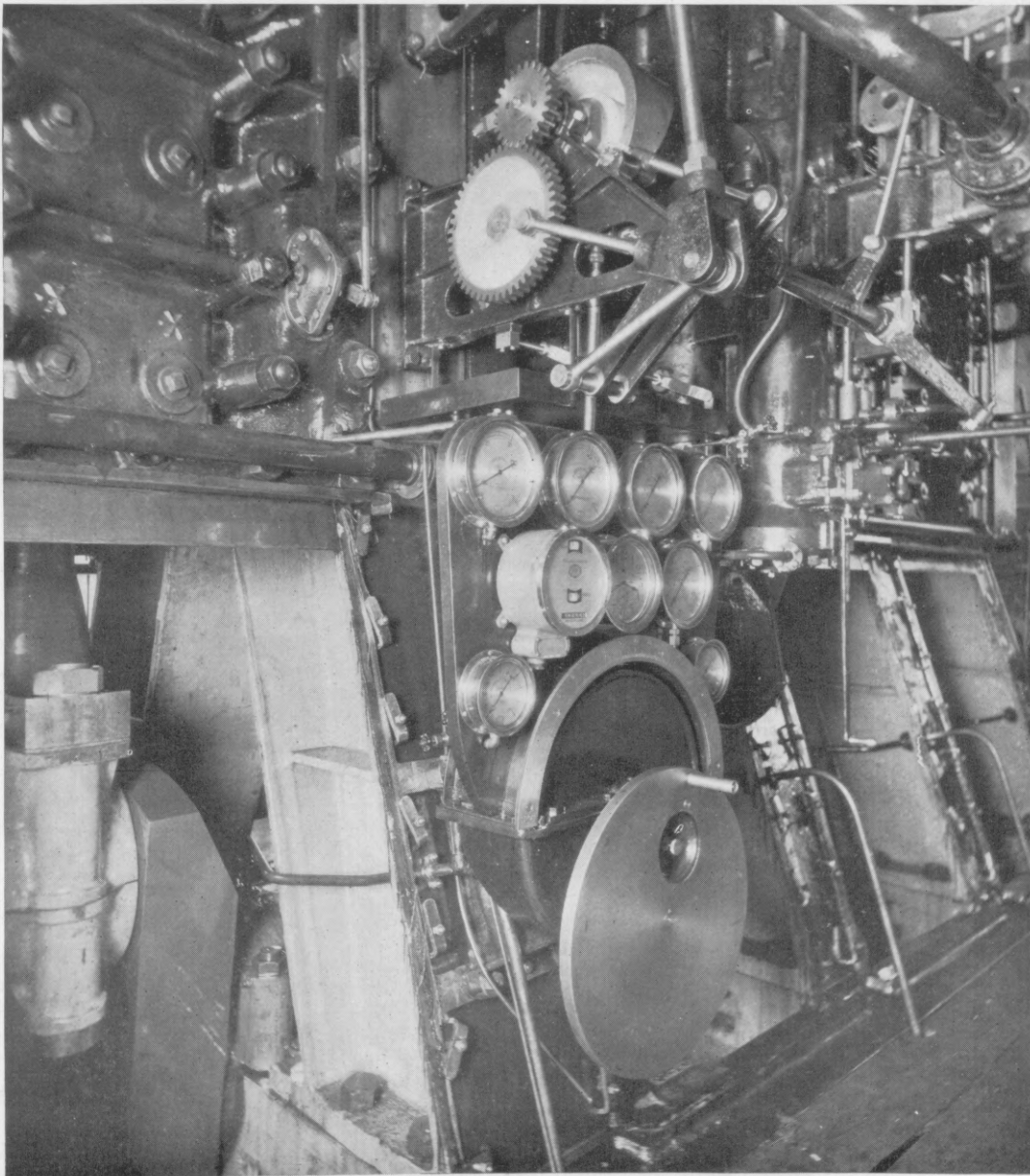
It amounted to hardly more than a few handfuls. Excellent results were obtained with Socony Diesel lubricating oil, recently marketed for heavy Diesel service, and the fact that its greenish color was not altered is regarded as conclusive testimony that the pistons did not blow appreciably. The Socony Oil appears to be of an unusually heavy body and is readily distinguishable from other Diesel lubricating oils by its pronounced greenish tinge.

Further evidence that bearing lubricating conditions were correct throughout the entire test is furnished by the fact that the Shipping Board inspectors apparently did not consider it worth while to pull adrift any crankpin or main bearings; they ran so cool and smoothly throughout the 30 days that no better check on their good condition could have been obtained. All the adjustments of clearances were made by Laminum shims, which are indistinguishable from solid brass plates, and give the bearings a degree of solidity and accuracy of alignment obtainable with sheet metal shims only by the exercise of additional care.

One of the most interesting facts brought out by the long run with heavy sulphur fuel seems to be that it offers no terrors to large exhaust valves—10 in. diameter—if they be properly designed. It has been held in some quarters that the 2-cycle engine exhausting through ports is the only one capable of burning high-sulphur fuels.

An examination of the exhaust valves of this Shipping Board engine, however, would incline many to the belief that sulphur will not attack or otherwise injure even the largest exhaust valves if they be correctly designed and manufactured. From the illustrations reproduced herewith it will be seen that the seats on both heads and cages appear flawless.

One of the explanations given for this is that the valves are made of unusually high-grade material, but stress is laid also on the



*Control stand, with crankcase doors removed on both sides*

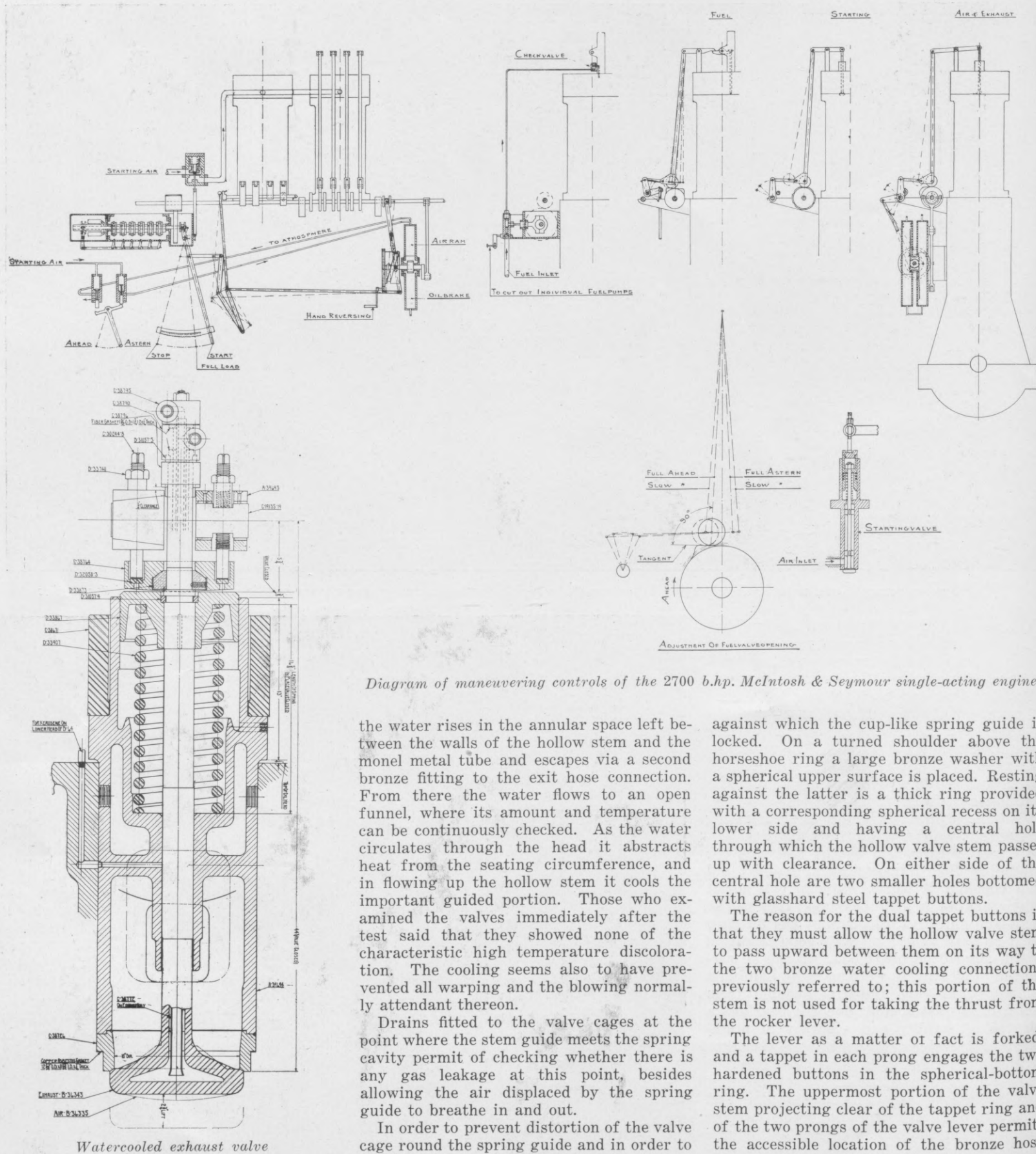


Diagram of maneuvering controls of the 2700 b.h.p. McIntosh & Seymour single-acting engine

the water rises in the annular space left between the walls of the hollow stem and the monel metal tube and escapes via a second bronze fitting to the exit hose connection. From there the water flows to an open funnel, where its amount and temperature can be continuously checked. As the water circulates through the head it abstracts heat from the seating circumference, and in flowing up the hollow stem it cools the important guided portion. Those who examined the valves immediately after the test said that they showed none of the characteristic high temperature discoloration. The cooling seems also to have prevented all warping and the blowing normally attendant thereon.

Drains fitted to the valve cages at the point where the stem guide meets the spring cavity permit of checking whether there is any gas leakage at this point, besides allowing the air displaced by the spring guide to breathe in and out.

In order to prevent distortion of the valve cage round the spring guide and in order to reduce the weight of the individual parts of the valve unit, the bolting flange is formed as a separate unit. The latter is hardly more than a bored flange resting on a shoulder of the valve cage body and provided with the necessary stud holes. As the shoulder is situated several inches above the cylinder head surface the thickness of the loose flange adds to the height at which the nuts are situated and permits the use of studs that are longer than usual. The latter feature has been found a useful means for preventing stud breakage.

A groove turned in the valve stem permits the insertion of a horseshoe-shaped ring,

against which the cup-like spring guide is locked. On a turned shoulder above the horseshoe ring a large bronze washer with a spherical upper surface is placed. Resting against the latter is a thick ring provided with a corresponding spherical recess on its lower side and having a central hole through which the hollow valve stem passes up with clearance. On either side of the central hole are two smaller holes bottomed with glasshard steel tappet buttons.

The reason for the dual tappet buttons is that they must allow the hollow valve stem to pass upward between them on its way to the two bronze water cooling connections previously referred to; this portion of the stem is not used for taking the thrust from the rocker lever.

The lever as a matter of fact is forked, and a tappet in each prong engages the two hardened buttons in the spherical-bottom ring. The uppermost portion of the valve stem projecting clear of the tappet ring and of the two prongs of the valve lever permits the accessible location of the bronze hose connection for supplying and leading away the water.

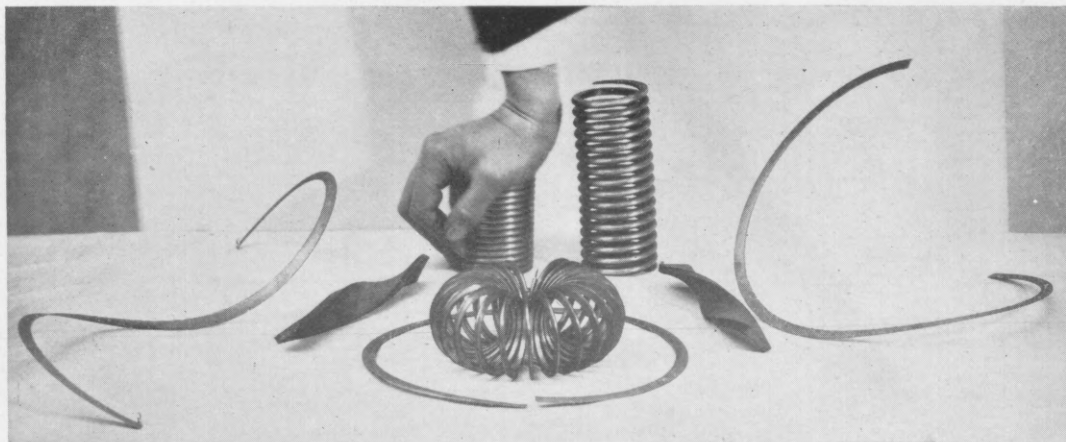
Wide differences in adjustment of the two tappet screws cannot "cock" the guide because of the spherical washer, which also reduces to the smallest value mechanically attainable the side component brought to bear on the guide through the tappets. The appearance of the guides, as well as of the bores in which they worked, confirmed the belief that the mechanical arrangements above described had more than met all requirements.

The starting valves used on these engines are interesting because all the exterior de-

fact that the movable as well as the stationary parts of the valve are water-cooled. Water is supplied from independent pipes to long rubber hose connections leading to the exhaust valve stems. As the length of the rubber connection is considerable in relation to the lift of the valve, there is reason to expect that they will require renewal less frequently than other engine parts such as gaskets, packings and the like.

Water enters from the hose through a special bronze fitting to a monel metal tube extending so far down that it nearly touches the hollow head of the valve. In returning,





*All these pieces were made from the same iron that is used in the cylinder castings*

dropped to a pressure of 82 lb. per sq. in. at the last of the 25 maneuvers.

The starting valve arrangement insures against air-line explosions because any rise in pressure merely shuts the valve. So positive in fact is this action that the fuel pump and fuel valve are left in operation during the period of air starting. At the very first ignition the pressure rise shuts the valve and automatically puts an end to the use of starting air without bringing into play special maneuvering equipment. At the same time the inability of the valve to open when the cylinder pressure is high does not allow the possible refrigerating effect of starting air entering at ignition time.

The fuel valves appear to have been stripped of every inessential frill and their design seems to have been boiled down merely to those essentials the necessity of which experience has fully demonstrated. After the tests all the needle seats had an appearance so perfect that they might have been mistaken for spares freshly cleaned up or taken from stock, if the presence of a small amount of carbon on the blunt end of the needles has not made it easy to identify them as the ones actually used on the test.

It was interesting to observe on this engine that the essential McIntosh & Seymour way of arranging controls does not depart from the old established practice of the firm. Anyone accustomed to operating marine trunk piston engines installed by them in 1918 would be able to find his way about on this new engine. All the old features are there: new and improved in detail and in the matter of positive automatic operation, but not so much changed as to confuse in any way an engineer who has made himself at home with McIntosh & Seymour practice.

An especially good example of this is the

compression relief gear fitted to the cylinders and operated whenever the reverse shaft is actuated. The combined fitting for the relief valve and the indicator differ from that used on earlier engine types only in that the former were sometimes manually operated.

A lever-type of indicator motion is fitted to each of the six cylinders and also affords the possibility of conveniently driving the Bowser lubricators supplying fresh oil to the pistons and other engine parts. A special guard encloses the drive and protects it against wear and accidental derangements such as would have a tendency to produce distorted indicator cards. A Sperry revolution counter is fitted to the end of the camshaft and indicates on a dial fitted to the gage board.

Large straight spur gears, with only three idlers, communicate motion at half speed from the crankshaft up to the camshaft. Push-rods of the usual design, with rollers guided by means of short links, are operated by ahead or astern cams keyed to a sidewise shifting camshaft.

All the guide links are jointed at their stationary ends to short levers keyed to a common reversing shaft running the entire length of the engine and capable of being thrown back and forth by means of a link. The lower end of this link engages a crank on a rack-and-pinion shaft actuated during reversal by twin air rams. Each maneuver, from ahead to astern, or vice versa, is always accompanied by a complete revolution of the crank driving the link and therefore begins and ends with the cam rollers properly in place over the cams.

Duplicate air rams driving the rack shaft and reversing crank avoid the use of stuffing boxes because each of the cylinders is single-acting. At the same time the exhausting cylinder is made to act as a cushion. Reversal of the valve gear is ac-

complished by the simple movement of a single hand lever either into the ahead or astern position. It actuates either one or the other of two small poppet valves establishing communication between the starting air and the respective air cylinder. When seated, the poppet valve blocks off the compressed air supply, but permits exhaust air from the cylinder which it controls to escape past its stem and to the atmosphere. As soon as one of the valves is lifted, it cuts off the atmospheric vent and permits the admission of compressed air on the ram.

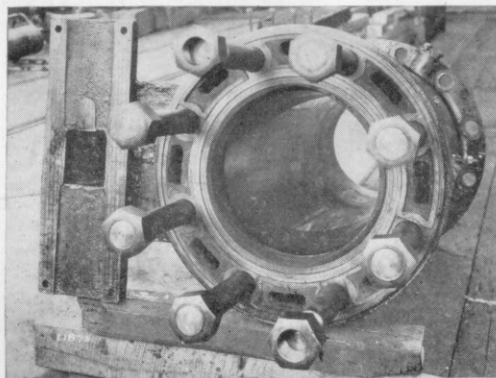
It is impossible to move the reversing lever except when the hand-wheel controlling the fuel and starting air is in the stop position. Correspondingly also the interlocking devices make it impossible to move the wheel from the stop position until the air rams have fully completed their travel in either one or the other direction.

In order to give starting air to the cylinders it is necessary to spin the hand-wheel through that part of its range over which it controls only the fuel pump. During that part of its travel it causes the lever actuating the starting air relay to move towards its tappet, without, however, producing any motion in the latter. Only after the "full speed" position of the fuel pointer has been passed does the air lever begin to touch the relay tappet, and a certain amount of additional motion is necessary to bring the pointer over into the full "start" position where both the fuel pump and starting air relay deliver their maximum.

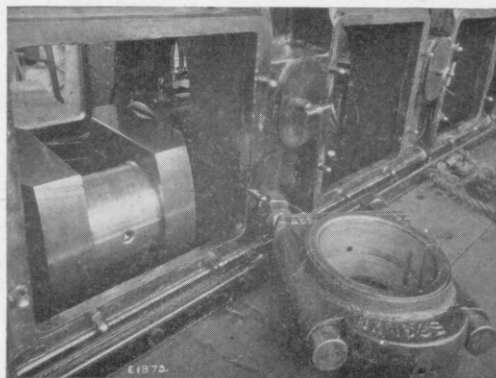
The engine then begins to turn on air, but also fires automatically at the very first instant the requisite compression temperature has been established. It is therefore unnecessary for the operator to guess when to shift from air to fuel, because as previously explained, the engine itself instantly stops using air as soon as ignitions begin. The increased pressure prevents the starting valves from opening, if at all, only late in the stroke. The release of the starting valve spring tension occurs soon thereafter anyway, in accordance with the timing. Naturally, as soon as the engineer hears the first ignitions he begins to turn the control wheel back towards the "fuel" position and thereby deprives the starting valves of the air pressure which must assist their springs if they are to open. The ability of the engines to maneuver positively down to 82 lb. per. sq. in. starting pressure as was done after the test, is attributed largely to the starting arrangement here outlined, and particularly to the partly automatic nature of the shift between air and fuel operation.

#### Compressor Engines

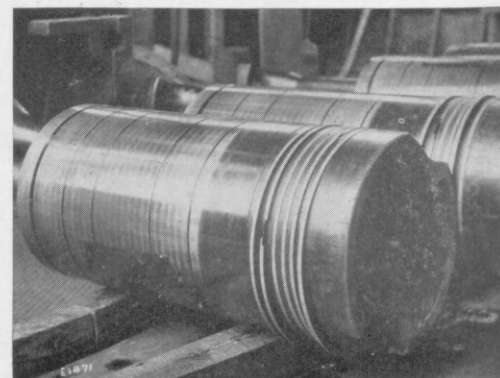
As already stated, no injection air compressors are fitted to the main engines, air



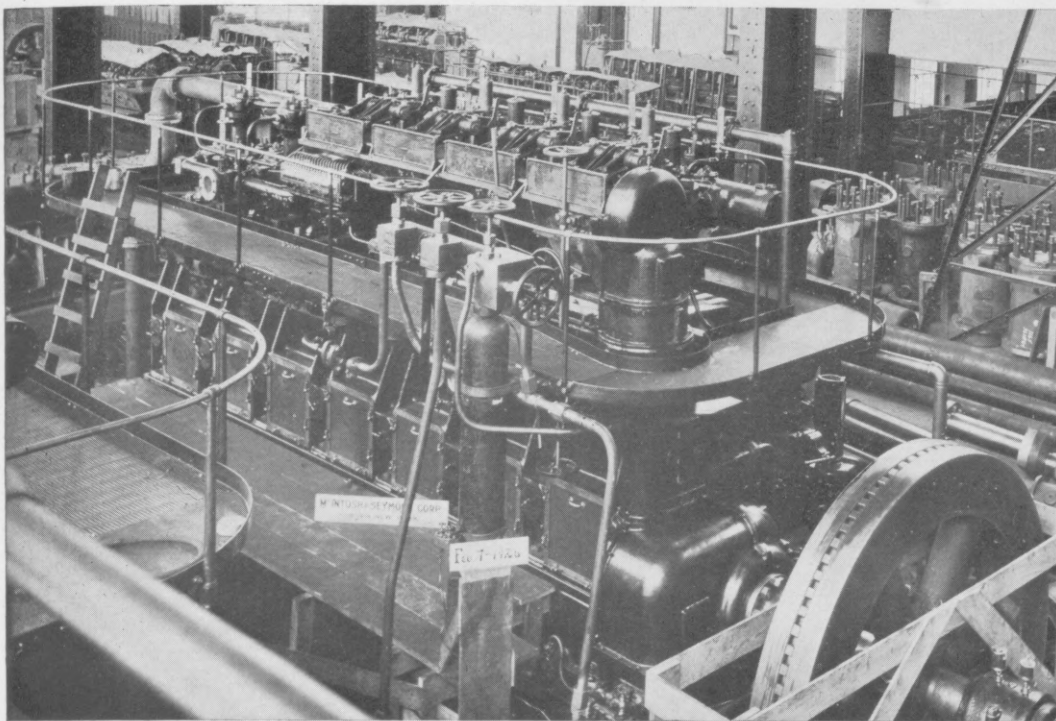
*Auxiliary engine cylinder after trial*



*Crankpin and big end of auxiliary engine*



*Piston of auxiliary engine after trial*



All air for the main engines is furnished by independently driven compressor sets as above

for injection and starting purposes being supplied by independent Diesel units. These are box-frame engines of the trunk piston type, running at 200 r.p.m., with dimensions on the power cylinders of 17 in. by 24 in. There are four cylinders delivering power to a crankshaft on which three throws for as many compressor cylinders are forged. Each of the latter is of the normal step-piston construction and their combined capacity is sufficient to supply air for the power cylinders driving them and for all the demands of the main engine. In the absence of a definite way of stating the capacity of such a combination, its nominal rating is given as 400 hp. The entire unit is built with a single bedplate and box-frame structure with a generator base at one end. The difference in power between that furnished by the Diesel cylinders and what is absorbed by the three compressor units is available at the end of the crankshaft for producing an amount of electrical power ordinarily sufficient to take care of all the auxiliary equipment on the ship while at sea. In port while there is no demand for injection air beyond the small amount required for the compressor engine's own purposes, practically the entire output of the Diesel cylinders is available for driving the generator and taking the greatly increased auxiliary load due to the cargo winches. As the result of this arrangement the unit is well utilized both at sea and in port and is considered to offer a neat solution of some of the problems involved in the installation of large single-screw motorships.

Owing to the fact that the Diesel compressor furnishes injection air at normal capacity during the greater part of the time when it is in service, no special unloading devices have been applied to the compressor cylinders.

The four Diesel cylinders and the three compressor cylinders are of normal design taken from stock. In building these units it was necessary only to provide longer bedplates, crankshafts and box frames. Owing to the complete conformity of all these elements with current and well-established

practice, it is not considered necessary to discuss them at length here.

Illustrations reproduced herewith showing the pistons exactly as they were withdrawn after the test showed that the rings remained almost entirely free from sticking and that the surfaces of the piston trunks wore to a glassy, high-lustre polish. The bedding appears to have been excellent as the uniform distribution of the high spots and tool mark patterns graphically illustrates.

A discoloration of the lubricating oil in the force feed circulating system might have led to the expectation that contamination with the low-grade fuel would have had some effect on the major bearings. The latter, however, were in the same excellent condition as that observed on the pistons. Both the babbitt of the upper crank-pin halves and the surfaces of the crank-pins showed perfect bedding and a highly uniform contact pattern which demonstrated to the satisfaction of observers that the lubricating conditions here

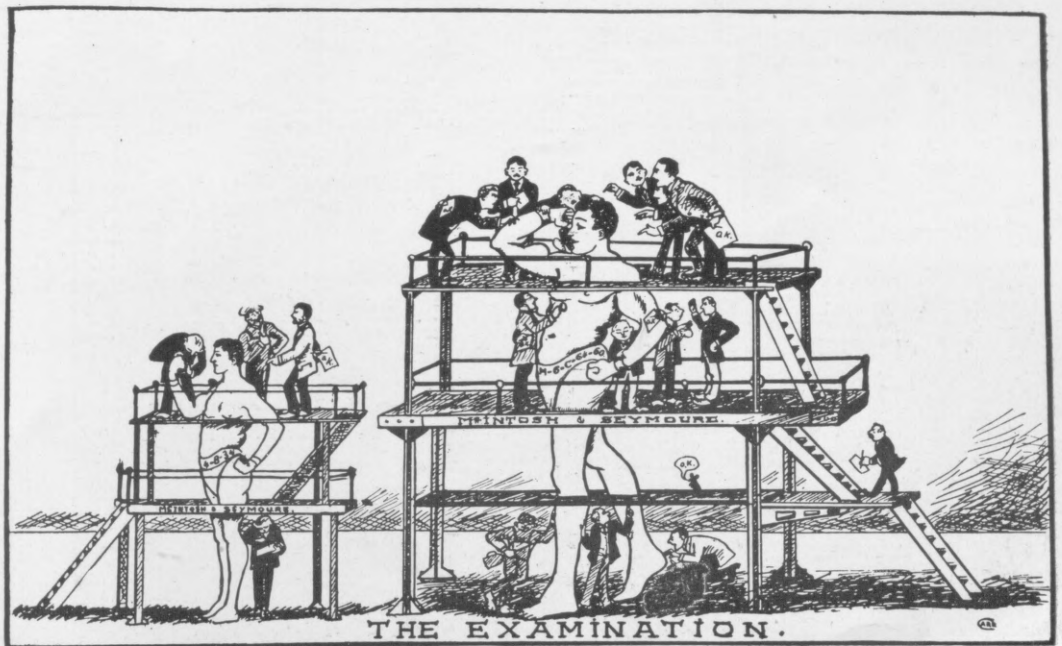
as elsewhere throughout the engine had been maintained at a high degree of efficiency.

The unusual conditions created in the erecting shop by the necessity of testing the huge engine for thirty days continuously made it impossible to locate the compressor unit as close to the main engine as would have been the case in an actual ship board installation. As the result of this there was a 80 lb. pressure loss between the compressors and the main engine, a figure which corresponds to a substantial overload imposed on the small unit. In dealing with injection air having a main pressure around 900 lb. per sq. in., 80 lb. more or less is a very considerable matter and justifies the belief that the compressor units were working at much more than their rated capacity throughout the entire test.

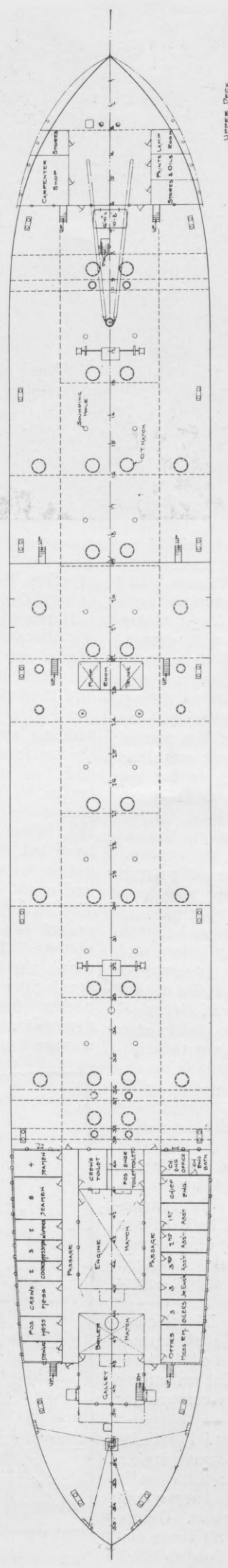
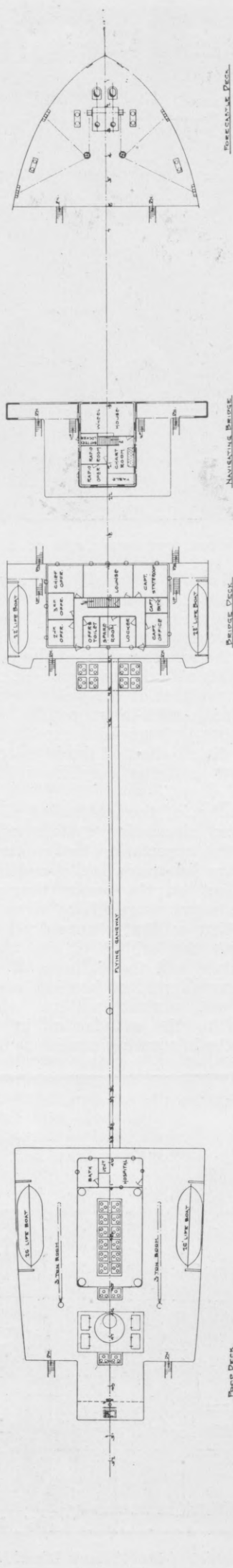
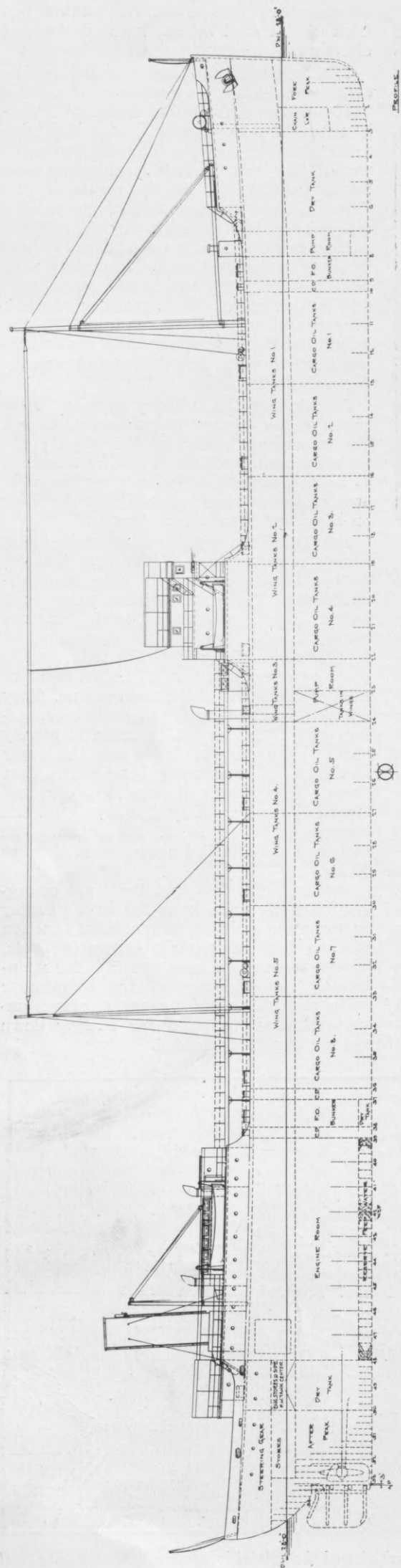
A look into the cylinder bores of these trunk piston engines more than confirmed the impression made by the piston; the polished surface visible in the liners seemed to be flawless and to indicate by the presence of tool marked tracings that the wear on them had been inconsiderable.

Two standby compressors arranged along lines similar to that of the unit just described form a part of the ship board installation. These are nothing more than twin-cylinder 4-cycle Diesel engines equipped with compressors large enough for the excess air furnished by them beyond their own requirements to be sufficient to meet the demands of the main engine. They are also direct-connected to electric generators and their normal function is merely that of supplying current in case the larger auxiliary unit previously described is shut down. The Diesel cylinders have bore and stroke dimensions of  $13\frac{5}{8}$  in. by 18 in. and normal operation is at 275 r.p.m. The rating of the attached generator is given as 75 kw.

Owing to the fact that these are emergency standby units in so far as air supply is concerned and that their normal function will be that of electric generating sets, special means have been provided for maintaining the efficiency of the compressor while running in this manner, clearance unloaders being provided for cutting down the air supply as needed.



How the cartoonist of the "Auburn Diesel News" viewed the official inspection after the long trial



PRINCIPAL DIMENSIONS	
LENGTH OVERALL	478'-3"
LENGTH BET DECKS	460'-0"
BEAM	65'-0"
DEPTH	38'-0"
DEADWEIGHT	13,200 TONS
GENERAL ARRANGEMENT.	
MADE BY	JAY
DATE	12.20.25
NEW YORK SHIPBUILDING CORPORATION	
CAMDEN, NEW JERSEY, U.S.A.	
DR 304-202-A	
-6.10.26	

# Gulf Refining Co.'s Big New Motortanker

Commissioning of *Gulfcrest*, 13,895 tons d.w.c. and 3200 b.h.p.

Adds Another Big Unit to American Motortanker Fleet.

**G**ULFCREST, the 13,895 ton d.w. motor-tanker laid down at the Camden Shipyard of the American Brown Boveri Electric Corporation to the builder's own account and finished for the Gulf Refining Co., has now gone in service. Preliminary particulars of this ship and of her machinery were given in *MOTORSHIP* for Nov., 1925.

Twin A.B.B.-Werkspoor engines of 3200 b.h.p. aggregate form the main propelling machinery, and two Ingersoll-Rand oil engine generating sets of 72 kw. capacity each take the entire auxiliary load while the ship is at sea. Two Scotch boilers supply steam to take the greater share of the port load consisting mainly of cargo heating and handling and deck machinery.

## Characteristics of *Gulfcrest*

Length overall	479 ft. 3 in.
Length b.p.	460 ft. 0 in.
Beam, molded	65 ft. 0 in.
Depth, molded	38 ft. 0 in.
Loaded draft	28 ft. 4 5/16 in.
Total deadweight	13,895 tons
Loaded displacement	19,485 tons
Gross tonnage	8,952 tons
Capacity main cargo tanks	3,489,716 gal.
Capacity 8 summer tanks	815,216 gal.
Capacity 2 waste oil tanks	51,518 gal.
Capacity fuel oil bunkers	288,248 gal.
Block coefficient	0.783
Speed at 27 ft. draft	11.5 knots

The hull is built on the Isherwood longitudinal system, with a straight stem, cruiser stern and the usual expansion trunk and summer tank arrangement. Longitudi-

nal and transverse bulkheads provide 8 double cargo tanks, 8 wing summer tanks, 2 waste oil tanks, 4 fuel oil bunkers, fore hold, pump room, machinery space, a day tank between machinery space and stern and fore and aft peak trimming tanks, these latter with capacities of 206 tons and 169 tons respectively of salt water. Feed water reserve for the two Scotch boilers is carried under the machinery space in a double bottom.

The main engines are similar to those used in the motorships *ASHBEE* and *JACKSONVILLE*, except that the cylinder and cylinder head are made separate instead of in one piece, the piston cooling-telescopic tubes have been changed to suit fresh water cooling, and the exhaust manifold has been changed from overhead to the side of the engine and is now lagged instead of water-cooled. There is also an air-distributing block located at the maneuvering stand underneath the gage board, allowing the engineer on watch to control the injection air for both engines from a central point and making it possible for him to bleed air from one bottle to another as conditions require. In view of the fact that the one licensed engineer on watch may be called upon to maneuver both engines at almost any time, the advantages of this new arrangement are obvious.

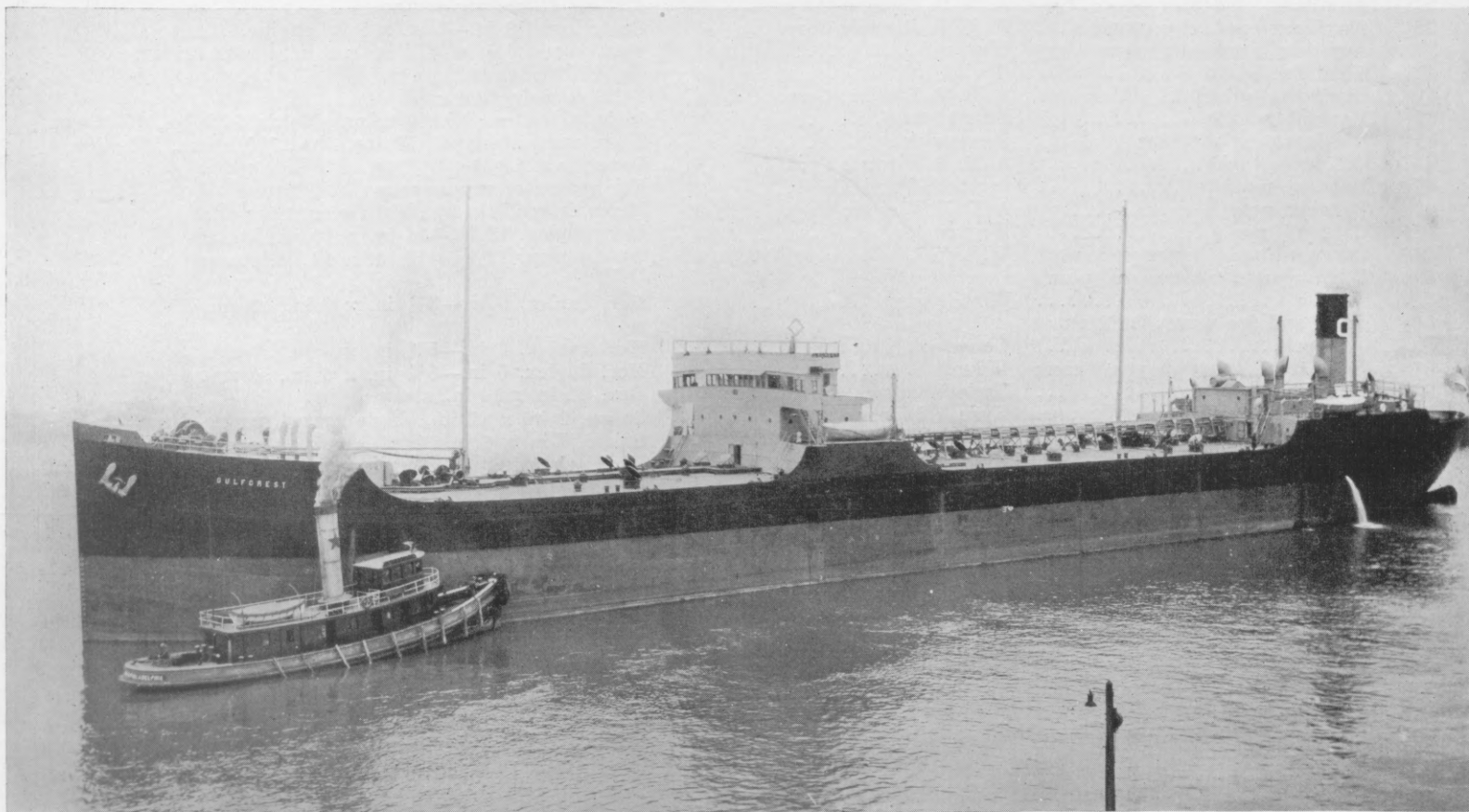
The main engines have 6 cylinders 27 in. diameter by 47 in. stroke, and each engine develops 1,600 b.h.p. at 115 r.p.m. driving its own 3-stage air compressor from a forward extension of the crankshaft.

In *GULFCREST*'s engines the steel tie-rods and cylinder beam characteristic of the Werkspoor design since early days are united with the cast-iron A frames first incorporated in Werkspoor practice by the engineers of the Camden firm.

## Characteristics of *Gulfcrest*'s Engines

Indicated power, per engine	2100 i.h.p.
Shaft power, per engine	1600 s.h.p.
Speed	115 r.p.m.
Number of cylinders	6
Cylinder diameter	27 in.
Piston stroke	47 in.
Volume swept by piston	
(per stroke)	93.44 cu. ft.
Crankshaft diameter	17 in.
Pressure maneuvering air	350 lb. per sq. in.
Pressure injection air	1000 lb. per sq. in.
Length overall (excl. thrust bearing)	40 ft. 2 1/2 in.
Width overall at bedplate	10 ft. 3 in.
Flywheel diameter	8 ft. 8 in.
Flywheel weight	21,900 lb.

Separate cylinder liners, flanged within the water jacket space to the downward-projection of the cylinder heads, are used. By this arrangement the advantages of the older integral construction are retained, i.e., the use of a heavy flanged joint in the way of the combustion space is avoided. The joint between the upper end of the separate liner and the cylinder head is not subjected to the axial cylinder load as is the case with the joint between the cylinder head and the cylinder beam. The liner joint is therefore made up with relatively small bolts required simply for making up a gas-tight joint. It is located far enough down to avoid metal



*Gulfcrest*, the latest addition to the fleet of the Gulf Refining Co., being moved out into the river at Camden, N. J., for trial

## Details of Machinery Equipment of Motortanker Gulfcrest, 8952 Tons Gross, 13,895 Tons d.w.c., 3200 s. hp.

ITEM NO.	NAME	MAKE	QUANTITY	CHARACTERISTICS
1	Main engine .....	A. B. B. Electric Corp. ....	2	Werkspoor type, 6 cylinders—27 in. x 47 in., 115 r.p.m.
2	Main air compressor .....	A. B. B. Electric Corp. ....	2	3-stage, 2100 i.hp. each. 23¼ in.—20½ in.—5¼ in. x 20 in., driven by main engine.
3	Auxiliary air compressor .....	Worthington .....	1	Steam driven, 17 in. x 13 in., 8½ in.—4¼ in. x 8 in. vert. dup. 3-stage, 350 r.p.m. Capacity 325 cu. ft. per min.
4	Emergency air compressor .....	Worthington .....	1	Steam driven, 4¼ in.—1½ in. x 5 in. vert., 2-stage, 4½ in. x 4 in. vert. steam eng., Engberg.
5	Injection air bottles .....	National Tube Co. ....	4	Capacity 8 cu. ft. each, 1000 lb. per sq. in.
6	Starting air tanks .....	A. B. B. Electric Corp. ....	2	Capacity 753 cu. ft. each, 350 lb. per sq. in.
7	Diesel generators .....	Ingersoll-Rand Co. ....	2	72 kw. Diesel driven direct-connected, 230 volts, 3-cylinder, 11 in. x 15 in., 315 r.p.m.
8	Auxiliary generator .....	General Electric Co. ....	1	25 kw., direct current 230 volts, 9 in. x 7 in. steam engine, 400 r.p.m.
9	Lighting motor-generator .....	General Electric Co. ....	2	10 kw. direct current, 115 volts.
10	Fuel oil transfer pump.....	Worthington .....	2	Rotary, 100 g.p.m. Motor 7½ hp., 850 r.p.m., 220 volts.
11	Fuel oil daily supply tank.....	A. B. B. Electric Corp. ....	2	Capacity 7200 gal., total.
12	Starting oil tank .....	A. B. B. Electric Corp. ....	1	Capacity 400 gal., total.
13	Fuel oil strainers.....	Bowser .....	2	Steam jacketed.
14	Lub. oil tank .....	A. B. B. Electric Corp. ....	1	2 compartments, total capacity 4000 gal.
15	Lub. oil pumps .....	Worthington .....	2	Rotary, 200 g.p.m. Motor 15 hp., 850 r.p.m., 220 volts.
16	Lub. oil sump tank .....	A. B. B. Electric Corp. ....	1	Capacity 1200 gal.
17	Lub. oil settling tank .....	A. B. B. Electric Corp. ....	1	Capacity 1000 gal.
18	Lub. oil purifier .....	DeLaval .....	1	Motor ¾ hp., 220 volts.
19	Lub. oil filter .....	Bowser .....	1	No. 1 Type C-S.
20	Cooling water pumps .....	Worthington .....	2	6 in. O. S. volute, 1000 g.p.m. Motor 40 hp., 1700 r.p.m., 220 volts.
21	F. W. piston cooling pump .....	Worthington .....	1	Triplex 7 in. dia. x 8 in. stroke, 200 g.p.m. Motor 10 hp., 900 r.p.m.
22	Piston cooling water cooler ....	Andale Eng. Co. ....	1	Single pass. Cooling cap. 200 g.p.m.
23	Bilge pump .....	Worthington .....	1	Triplex, 8 in. dia. x 10 in. stroke, 250 g.p.m. Variable speed motor 450 to 900 r.p.m., 5 hp. to 10 hp.
24	Bilge pump .....	Warren .....	1	Hor. duplex, 6 in.—5¼ in. x 6 in., steam driven.
25	Fire and bilge pump.....	Worthington .....	1	Triplex, 8 in. dia. x 10 in. stroke, 300 g.p.m. Motor 30 hp., 900 r.p.m.
26	Sanitary pump .....	Worthington .....	1	2 in. O. S. volute—100 g.p.m. Motor 7½ hp., 1700 r.p.m., 220 volts.
27	Fresh water pump .....	Warren .....	1	Hor. duplex 4½ in.—4 in. x 4 in. steam driven.
28	Fresh water tanks .....	A. B. B. Electric Corp. ....	2	Capacity 60 tons, total.
29	Donkey boilers .....	A. B. B. Electric Corp. ....	2	S. E. Scotch type, 12 ft. 6 in. diameter x 11 ft. 0 in. long. Total heating surface, 17,439 sq. ft. Working pressure, 150 lb. per sq. in.
30	Fuel oil service pumps .....	Warren .....	2	Vert. simplex, 5½ in.—3½ in. x 6 in., steam driven.
31	Fuel oil heaters .....	Bethlehem .....	2	No. 4 size.
32	Mayflower burners .....	Babcock & Wilcox .....	4	Combined blower and burner type. Blower, 13 in. diameter.
33	Inspection tank .....	A. B. B. Electric Corp. ....	1	.....
34	Feed and filter tank .....	A. B. B. Electric Corp. ....	1	460 gal. capacity.
35	Feed pumps .....	Warren .....	2	Vert. simplex, 9 in.—6 in. x 16 in., steam driven.
36	Feed water heater .....	Griscom Russell .....	1	Reilly, 22,000 lb. water per hour.
37	Auxiliary condenser .....	A. B. B. Electric Corp. ....	1	1915 sq. ft. cooling surface.
38	Auxiliary cond. circ. pump ....	A. B. B. Electric Corp. ....	1	Centrifugal, 8 in.—5 in. x 5 in. engine.
39	Auxiliary cond. air pump .....	Warren .....	1	Vert. beam, 6½ in.—12 in. x 8 in., steam driven.
40	Hand fire pump .....	Goulds .....	1	No. 16 Challenge.
41	Engineers' oil tanks .....	A. B. B. Electric Corp. ....	4	Total capacity 765 gal.
42	Ventilator fans .....	Sturtevant .....	2	36 in. diameter. 10,800 c.f.m. Motor, 52 b.hp., 610 r.p.m.
43	Refrigerating machine .....	Brunswick .....	1	2-ton, ammonia type. Motor, 5hp., 180 r.p.m., 220 volts.
44	Oil drain tank .....	A. B. B. Electric Corp. ....	1	Capacity 225 gal.
45	Exhaust mufflers .....	Ingersoll-Rand Co. ....	2	For generator engine sets.
46	Turning gear .....	A. B. B. Electric Corp. ....	2	Motor driven, 7½ hp., 900 r.p.m., 200 volts.
47	Cargo oil pump .....	Warren .....	4	Hor. duplex, 16 in.—14 in. x 18 in., steam.
48	Cargo oil pump (summer tanks)	Warren .....	2	Hor. duplex, 12 in.—10 in. x 12 in., steam.
49	Bilge pump, cargo oil pump room .....	Worthington .....	1	Hor. duplex, 6 in.—5¼ in. x 6 in., steam.
50	Bilge and fire pump, for'd pump room .....	Warren .....	1	Hor. duplex, 6 in.—5¼ in. x 6 in., steam.
51	F. O. transfer pump, pump room	Warren .....	1	Hor. duplex, 6 in.—5¼ in. x 6 in., steam.
52	Windlass .....	Hyde Windlass Co. ....	1	Hor., 11 in. x 14 in., steam.
53	Winches .....	Hyde Windlass Co. ....	2	Steam, 9 in. x 12 in., single geared, single drum.
54	Capstan .....	Hyde Windlass Co. ....	1	Steam, 8 in. x 8 in.
55	Steering gear .....	Hyde Windlass Co. ....	1	Hydro-electric. Constant speed motor, 35 hp., 500 r.p.m., 230 volts.

accumulations in the neighborhood of the combustion space and at the same time is situated high enough to make it unnecessary for any piston rings to travel over it.

Among the advantages claimed for the arrangement are that it allows a worn cylinder to be renewed at relatively slight expense and renders possible the use of a liner poured from metal better suited for it than would have to be employed for the entire integral casting. The construction really is equivalent to the use of independent and separate cylinder heads, on which there

is nothing to wear out. Moreover, the foundry work involved in the production of the cylinder head is simplified and results in a lowered percentage of rejected castings.

In conformity with the widespread trend towards the use of fresh water for cooling purposes, the piston cooling system has been arranged to use fresh water instead of salt. The piping necessary for this has been arranged, but its disposal is such as to enable salt-water cooling to be used for the pistons at short notice. Fresh water is carried in large amounts (197 tons in all, for

boiler feed and other purposes) and its incidental use for piston-cooling appears entirely rational. Scale formation in the pistons is avoided, while leakage from the piston cooling tubes is not nearly so objectionable when the water is non-corrosive.

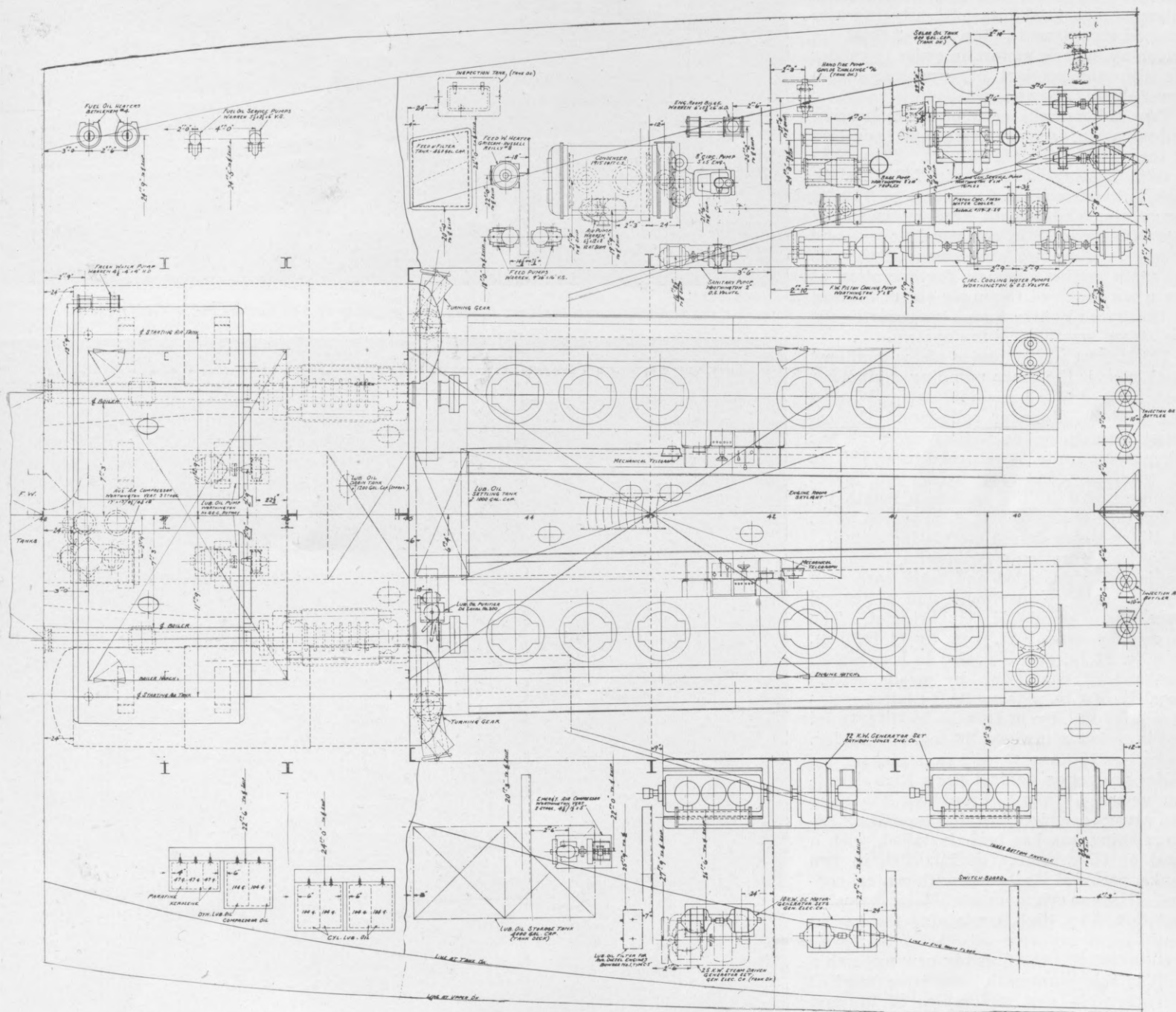
In these engines the camshaft drive, as well as the reversing system—characterized by the use of valve levers mounted on skew-eccentric fulcrums, with ahead and astern cams keyed to a non-shifting camshaft—is substantially the same as originally devised by Werkspoor in Amsterdam.

The fulcrum shaft about which the valve levers oscillate in response to the motion imparted to them by the cams, is fitted with discs, one for each lever, which are not only eccentrically mounted, but which lie in planes not at right angles to the fulcrum shaft centerline. Reversing the engine consists merely in turning the fulcrum shaft through half a turn. As the result of this, the eccentricity of the fulcrum discs first lifts the cam rollers clear of the extreme cam tops while continued rotation of the shaft causes a certain amount of sidewise motion due to the obliquity of the discs.

more attention on the part of the operating engineer than is necessary for throwing over a single hand lever. The exhaust gas manifold is abreast of this cylinder beam, with horizontal elbows from the valve chambers. This is in contrast to the engines of the ASHBEE and JACKSONVILLE in which vertical connections were used for tying in to an overhead manifold. On GULFCREST'S engines the manifolds are lagged instead of water-cooled, in order that the heat of the gases may be economized as far as possible for the sake of exhaust-gas heating in the boilers. At the same time clearing away

in single-screw installations. The overhead exhaust manifold is now replaced by suitable facilities for handling the valve-gear, as would be rendered especially desirable by the relatively large size and correspondingly heavy weights, such as exhaust valve cages. At the same time the engineer's general view of the machinery in his charge is unobstructed and the appearance of the engine room improved.

The thrust of each propeller is taken up by a multi-collar thrust block having 8 shoes. The thrust shaft is 13½ in. diameter and 12 ft. 6½ in. long and the total



Plan of the engine room of the twin-screw 3200 s.h.p. motortanker *Gulferest* recently completed for the Gulf Refining Co.

After the 90-degree position in the rotation of the fulcrum shaft is reached, the eccentric centers pass their extreme top position and as they descend they move the cam rollers down again, replacing them on the cam-shaft and in contact with the astern cams keyed directly next to the ones used for ahead running.

A rack geared to a pinion on the fulcrum shaft and deriving motion from an air-oil servomotor cylinder carries out the reversing operation in one stroke, without any

the heavy pipes and connections from over the top of the engine has manifest advantages in so far as manipulation of the engine valve gear is concerned. Each section of the exhaust manifold has its own expansion joint, as would be rendered advisable by the relatively short length of the exhaust elbow connections.

In the twin-screw ship the location of the exhaust manifold alongside of the cylinder tops is favored because the engine room casing interferes much less than is the case

length of shafting from the aft coupling of the thrust shaft is 52 ft. 11⅞ in. Propellers are 4-bladed manganese bronze units of the built-up type with hubs of cast iron, the diameter being 14 ft. 0 in. and the pitch 11 ft. 3 in., with a total projected area of 58.5 sq. ft. and a disc area of 154 sq. ft.

Realizing that continuous operation of steam auxiliaries at sea would add several tons to the daily fuel consumption, the designers of GULFCREST have provided oil-electric auxiliaries capable of maintaining

all the essential services outside of propulsion. There are two Ingersoll-Rand 3-cylinder engines (11 in. diameter by 15 in. stroke) developing 110 b.h.p. at 315 r.p.m. each, direct-connected with a 72 kw. G. E. generator and supplying current at 230 volts.

At sea the auxiliary load consists principally of the engine pumps and the steering engine, with the variable addition of the service pumps, bilge pump, ice machine and lighting. Engine pumps comprise the salt-water cooling pumps, the fresh water piston cooling pumps, the lubricating oil pumps and the pumps for the f.w. watercoolers. Other pumps used intermittently increase the load from time to time. All of them are driven by electric motors in order to render the ship independent of expensive steam power during the voyages.

Two boilers take care of cargo heating and pumping, tank steaming, and operation of the auxiliaries used in port. They have a total heating surface of 1743.9 sq. ft. each, a rated working pressure of 150 lb. per sq. in., and are oil fired by means of four Mayflower 13 in. combined blowers and burners. They are also arranged to take the main engine exhausts for operation at sea when required to supply steam heating in the living quarters and temporarily for the steam smothering fire system.

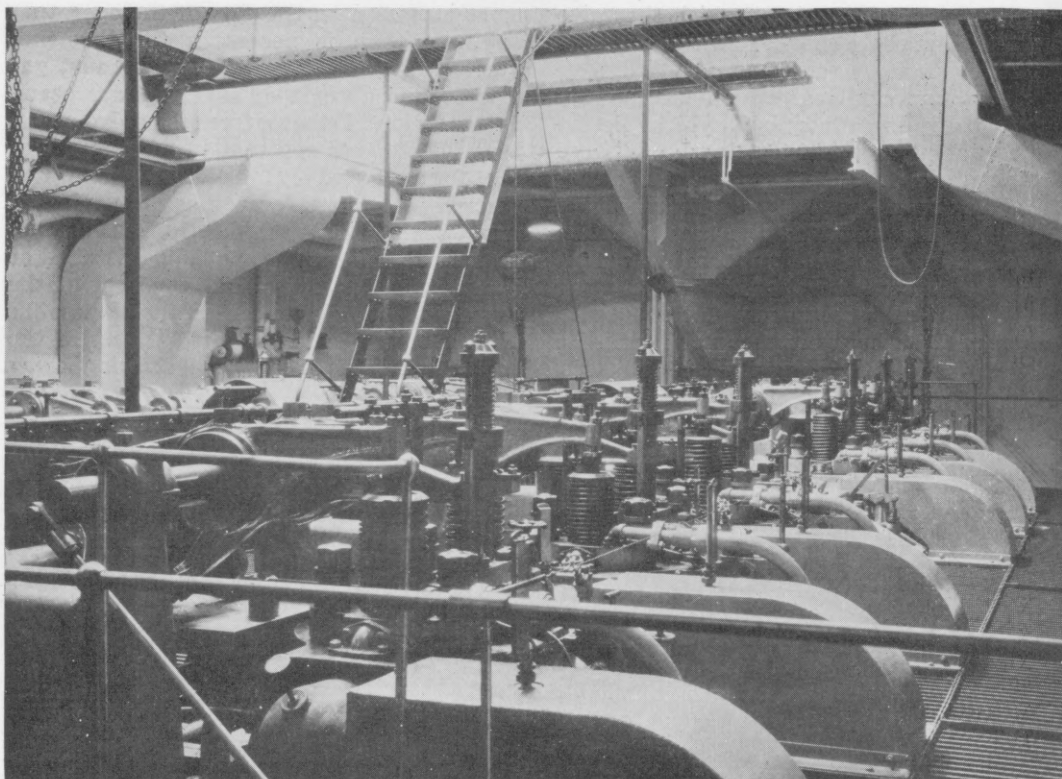
The largest single item of steam auxiliary machinery is the cargo pumping equipment, consisting of four horizontal duplex Warren units, 18 in. diameter cylinders. The exhaust from these, as well as from all the other steam units, is returned to a 1195 sq. ft. surface condenser with an inside diameter of 4 ft. 6 $\frac{1}{8}$  in. and a length between tube sheets of 6 ft. 3 in. served by an auxiliary steam driven circulating pump.

For refrigeration a Brunswick 2-ton ammonia set is installed and takes care of a meat storage compartment and a general storage and vegetable compartment. The former measures 7 ft. 8 in. by 11 ft. 6 in. by 6 ft. 11 in. and is cooled to between 20 deg. and 24 deg. Fahr. by means of 325 lineal ft. of 1 in. pipe, while the latter measures 6 ft. 0 in. by 11 ft. 6 in. by 6 ft. 11 in. and is cooled to between 36 deg. and 40 deg. Fahr. by 216 lineal ft. of 1 in. piping.

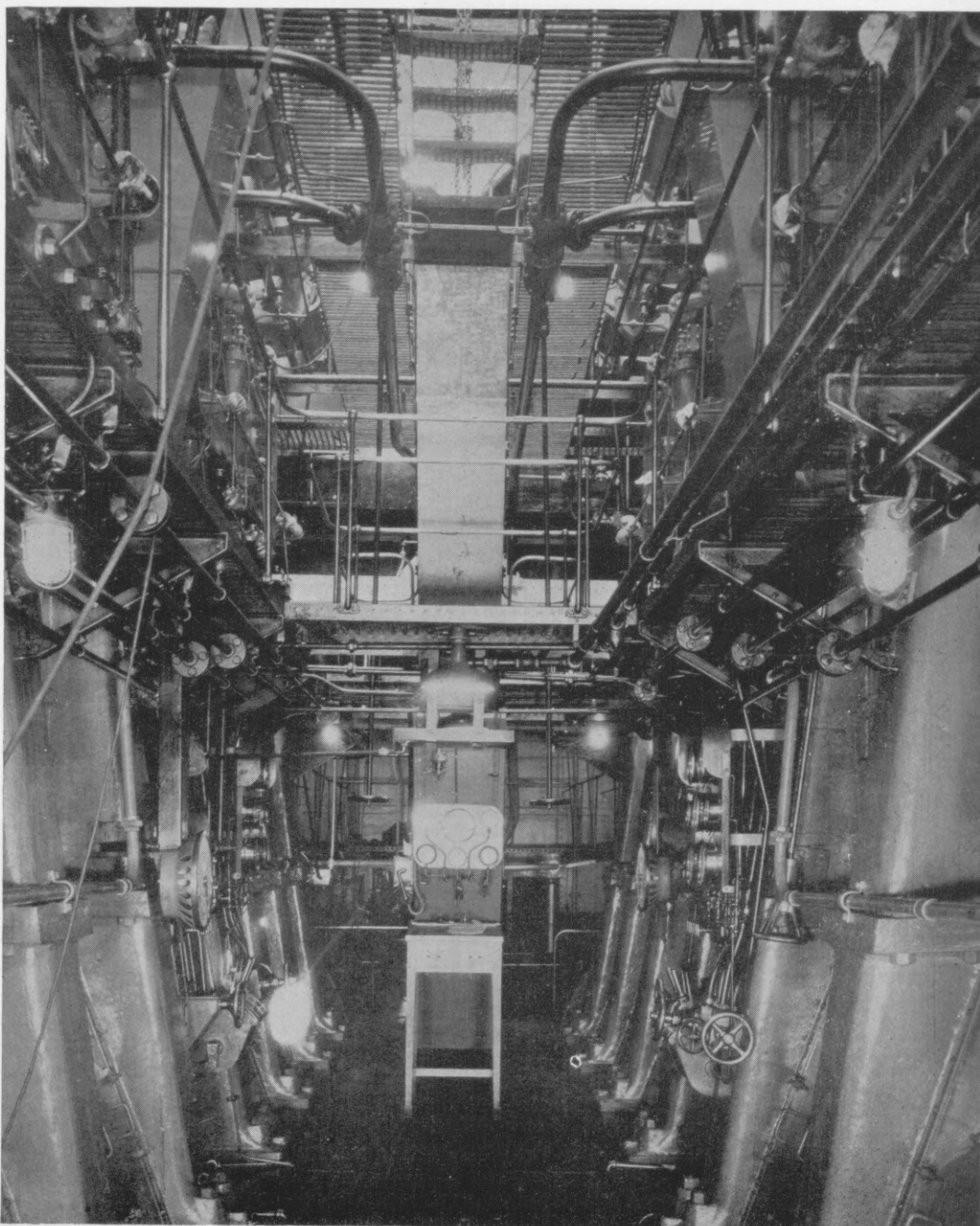
For protection against fire a Rich detecting system is piped throughout the ship, and a very complete installation of Lux extinguishing gas has been installed, with a total of 65 cylinders of Lux CO<sub>2</sub> in two banks, port and starboard, with central control. The gas cylinders are 8 $\frac{5}{8}$  in. diameter and 4 ft. 3 in. high, containing the gas in liquid form.

GULFCREST is the first big new motorship built in this country in some time, most of the other big new motorships of the last couple of years having been conversions.

Specifications for the new motorliner which the Swedish American Line plans to order are now being prepared and will be issued to shipbuilders at no distant date, states Filip Lindahl, technical director of the Line. Bids are to be invited from foreign as well as Swedish shipbuilders. The Swedish government loan to the Line will be reduced from 8,000,000 kr. to 6,000,000 kr. if the vessel is ordered outside Sweden, and Swedish shipbuilders therefore have a 2,000,000 kr. edge on their foreign competitors. The vessel will be larger than the GRIPSHOLM.



*Looking across the tops of the two engines of the motortanker Gulfcrest*



*Platform, middle grating and upper grating of the Gulfcrest's engine room*

# Contracts Signed for 4 Ship Conversions

Newport News and Fore River Shipyards Start Work of  
Dieselizing Shipping Board Vessels

CONTRACTS for the installation of Diesel engines in the Shipping Board vessels TAMPA, UNICOI, WEST HONAKER and WEST CUSSETA were signed last month, inaugurating the final stage of the program mapped out by the Shipping Board early last year when 14 Diesel engines of about 3000 hp. each were ordered for steamer conversions.

Successful completion of the 30 days endurance trials of the Worthington double-acting engine and of the McIntosh & Seymour single-acting engine and the subsequent acceptance of the auxiliary engine sets of the same makers foreshadowed the approaching signature of the contracts for alterations to the vessels in which this machinery is to be installed. The second Worthington engine and second McIntosh & Seymour engine have easily passed the much less severe test specified for duplicate engines. The way is all clear now for the shipyard work involved in the conversion of the first four vessels.

For the installation of the Worthington double acting engines the contract has been let to the Newport News Shipbuilding & Drydock Co., which has selected the TAMPA and UNICOI from the three vessels offered by the Shipping Board. An outline of the alterations which will be made in these ships was given in the January MOTORSHIP, with drawings of the vessels and of the proposed new engine room arrangement.

## Chief Characteristics of Tampa and Unicoi

Length overall ..... 416 ft. 0 in.  
Length b.p. .... 402 ft. 0 in.  
Beam, molded ..... 54 ft. 0 in.  
Depth, molded to shelter deck.... 33 ft. 9 in.  
Gross register ..... 5950 tons  
Net register ..... 3665 tons  
Deadweight capacity ..... 9400 tons  
Power of main engine ..... 2900 b.hp.  
Normal speed (service) .... about 11½ knots

Both vessels are expected to arrive at the Newport News shipyard this month. The

first one is to be delivered 120 days after it is received at the yard and the second one 135 days after the contractor gets it. Both ships should therefore be delivered to the Shipping Board complete before the end of October and after running trials should be in service by the beginning of next year.

Bethlehem Shipbuilding Corporation was successful in bidding for the installation of the McIntosh & Seymour single-acting engines, which are to go in the WEST HONAKER and WEST CUSSETA. The work is to be done at the Fore River Shipyard of the corporation at Quincy, Mass.

## Chief Characteristics of West Honaker and West Cusseta

Length overall ..... 423 ft. 9 in.  
Length b.p. .... 410 ft. 5 in.  
Beam, molded ..... 54 ft. 10 in.  
Depth, molded to shelter deck.... 29 ft. 9 in.  
Gross register ..... 5376 tons  
Net register ..... 3343 tons  
Deadweight capacity ..... 8600 tons  
Power of main oil engine ..... 2700 s.hp.  
Normal speed (service).... about 11¼ knots

Both these vessels, like the TAMPA and UNICOI, are lying in the James River, Va., and have to be delivered by the Shipping Board at the Fore River yard, where they will be completed 120 days and 135 days respectively after arrival.

Advantage is being taken of the conversion of the vessels to modernize them on deck and in their accommodation. All the deck machinery, including the steering gear is to be converted to electrical operation. Ten new electric winches are to be installed, a 45 hp. motor is to drive the windlass and a 25 hp. motor will be geared to the rudder quadrant.

Accommodation will be provided for 11 passengers amidships, requiring considerable additions to the midship structure. The crew's quarters are to be moved from the forecabin to a new deckhouse on the poop, and the forecabin space will be used for cargo. Automatic electric waterheaters will be provided to supply hot water in the

bathrooms and washrooms of the officers and crew.

Modern equipment, like Sperry gyro-compasses and Lux-Rich fire detecting and fire extinguishing systems, will be installed, so that when the vessels are completed as motorships they will be of a modern type, not as fast as the latest European ships of their size, but just as efficient in all other respects. The hulls are all in good condition, having been laid up in fresh water since they were taken out of active operation.

## Bids on 7th. S. B. Conversion.

For the installation of a 2700 s.hp. 4-cycle double-acting McIntosh & Seymour engine in the CROWN CITY and for the hull alterations to be made at the time of conversion from steam to Diesel power, four bids were received by the Shipping Board as follow:

### List of Shipyard Bids

NAME OF BIDDER	COST	DELIVERY
Bethlehem S. B. Corp...	\$427,500	150 days
Morse D. D. & R. Co...	332,000	160 days
Newport News S. B. & D. D. Co. ....	444,000	135 days
Todd Shipyards Corp...	472,178	135 days

Stipulation was made by the Morse Drydock & Repair Co. that its bid was conditional upon the award to it of all three vessels in which McIntosh & Seymour engines are to be installed. For the work on the two other vessels of that group the Morse firm had been the highest bidder. Lumping the two bids, the Morse price is \$1,348,000, which compares with a Bethlehem lump price of \$1,242,500. The other bids cannot be brought to this basis.

## Another 30 Day Trial.

Busch-Sulzer's completed in April the 30-days' endurance trial of the first of the 3000 b.hp. engines they are building for the Shipping Board, and the summary below is taken from the official figures:

### Busch-Sulzer Engine Test March 18—April 17

Average power ..... 3011 b.hp.  
Average speed ..... 89.24 r.p.m.  
Average mean indicated pressure,  
82.44 lb. per sq. in.  
Average mech. efficiency ..... 73.53 per cent  
Fuel consumed per 24 hr. .... 13.34 tons  
Fuel consumption per i.hp.-hr. .... 0.3041 lb.  
Fuel consumption per b.hp.-hr. .... 0.4133 lb.  
Average heat value of fuel per lb.,  
18,850 B.t.u.  
Brake thermal efficiency ..... 32.66 per cent  
Average lub. oil all purposes  
per 24 hr. .... 21.7 gal.

Fuel consumption is unusually low, when considered as the average figure of the first engine of this size built at the St. Louis works. It represents a notable performance for an engine of the 2-cycle type and emphasizes the progress that has been made in improving the efficiency of that type. The engine drives its own air-scavenge pump and injection air compressor.

## Privately Owned U. S. Ships

ABOUT three quarters of the American sea-going tonnage in operation is now privately owned, the Shipping Board vessels representing the remaining quarter. If one counts the laid-up tonnage as well as the active tonnage more than one-half of the total American Merchant Marine is now in the hands of private American owners.

Through various changes in ownership occurring during the quarter ending March 31st, the privately owned American Merchant fleet increased 31 in number and 131,512 gross tons, bringing the gross tonnage to a total of 5,622,470, of which more than 92 per cent was in active service on Apr. 1st. This is an increase of 169,132 tons over the total gross tonnage in service Jan. 1, 1926, and the number of active vessels

increased during the same period from 1926 to 1925. The 42 additional vessels placed in active service include 5 passenger ships, 34 general cargo carriers and 3 tankers.

The government owned fleet on Apr. 1 included 1062 ships of 5,306,215 gross tons, as against 1118 ships of 5,506,670 gross tons on Jan. 1, but only about one-third of the Shipping Board fleet is in active service, and that is employed only in the maintenance of trade routes where facilities furnished by privately owned American ships are insufficient to meet traffic requirements. These figures are based on the quarterly report of the Bureau of Research of the Shipping Board covering the ownership of U. S. vessels and the trades in which they are employed.

# Motorliner for New York-Bermuda Run

Big Diesel-engined Passenger Ship Planned by Furness Withy  
to be Ready for Operation in 1927-28 Season

**M**ODERNIZATION of the New York-Bermuda service of Furness Withy & Co. is promised by the addition next year of a passenger motorliner to operate between New York and Hamilton, the capital of the cluster of coral isles known as Bermuda, which has become a favored resort for vacationists from the eastern half of the United States.

Increasing numbers visit Bermuda each year. Winter traffic has practically outgrown the service and the summer traffic has become profitable. Competition has entered, giving an added incentive to improvement, and the Furness Bermuda Line is responding with the style of ship that furnishes the maximum comfort and attraction to travelers.

The new vessel will probably be larger and faster than the two vessels at present operating in the Furness service, and accommodation is to be provided for 600 first class passengers, about 50 per cent more than the present vessels carry. The run between New York and Hamilton is made at the present time in about 48 hours, the running speed being about 15½ knots. The ships operate practically continuously, staying only one day at the Bermuda end and two days in New York.

FORT VICTORIA and FORT ST. GEORGE, which are now maintaining the schedule, are twin-screw oil-burning steamers of about 14,000 tons displacement, measuring 411 ft. between perpendiculars, 56.7 ft. registered breadth and 23.5 ft. registered depth, with a deadweight capacity of 4900 tons including bunkers and registered as 7785 tons gross. They were built about 13 years ago by Beardmore's in Scotland and have water-tube boilers and quadruple expansion engines. Each vessel has excellent accommodation for about 400 first-class passengers, all cabins being fitted with running water and electric fans, while many have bathrooms attached. To take care of the Bermuda perishable freight, consisting largely of fruit, vegetables and cut flowers, the vessels have four insulated cargo chambers of about 50,000 cu. ft. with about 80 tons ice capacity. Potatoes and onions are the principal crops on the islands, and New York buyers are so zealous in combing the market that those commodities cost the inhabitants more than New Yorkers have to pay in their city.

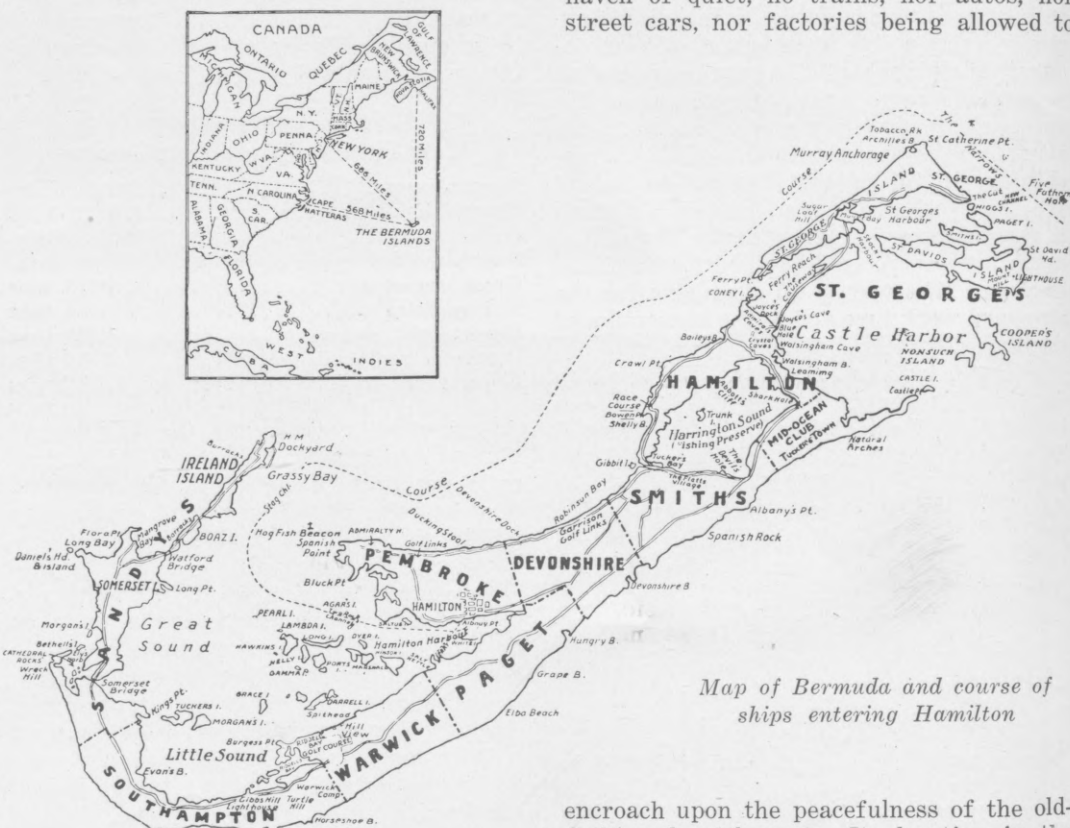
Two years ago the Royal Mail Steam Packet Co., which has always been active in the British trade of North America and the West Indies, entered the Bermuda business with the ARAGUAYA, a twin-screw vessel of 10,530 tons gross, 20 years old, diverted from the South American service of that company. She has proved popular during the season, but each summer she is withdrawn and put on her old run to Brazil and the Argentine.

A map on this page shows the main island of Bermuda and the course taken by the Furness vessels in proceeding to the terminal at Hamilton. A good deal of alteration of speed is necessary in going up to, or leav-

ing, her berth there, and it is understood that the idea of steam turbines for work of this nature was definitely turned down, because reciprocating engines were considered to have superior maneuvering qualities. It is within the realms of possibility that a Diesel-electric system of propulsion may be adopted because of the greater handiness it presents in quick maneuvering. Work is now being done on the preliminary

It is not yet known whether the new motorship will maintain service alongside two steamers. Until the sale of the FORT HAMILTON, which took place a couple of months ago when she was transferred to the Italian flag for service in the Adriatic, three ships maintained the Furness Bermuda service.

Bermuda is a tourist resort of increasing importance. It is being preserved as a haven of quiet, no trains, nor autos, nor street cars, nor factories being allowed to



Map of Bermuda and course of ships entering Hamilton

designs of this vessel in the London office of the Line and it is understood that bids will be asked in Great Britain in the immediate future for the construction of this vessel.

encroach upon the peacefulness of the old-fashioned settlement. Its location in the Gulf Stream endows it with an equable semi-tropical climate, the monthly average temperature ranging from 61 deg. in February to 76 deg. in September, and its relative proximity to New York enables it to compete with Florida in the winter and with Maine in the summer.

## Two 24 Knot Motorliners

**T**HE two fastest motorships in the world, nearly as big and fast as the MAURETANIA, are planned by the Cosulich Line of Trieste for its New York-Trieste service. They will be commenced almost immediately at the Cantiere Navale Triestino shipyard, Trieste. The length is expected to be about 700 ft., the gross tonnage about 30,000 and the speed about 24 knots. Regarded from the viewpoint of the industry as a whole, they will be epoch-making ships because their entry into service will mark the advent of the high speed passenger motorliner, at one time considered an impossibility.

These transatlantic motorliners have been under consideration for about six months and form part of a comprehensive motor-

ship construction program which the Cosulich plans to complete by 1930.

They will have B. & W. type double-acting engines similar to those selected for the SATURNIA and VULCANIA, 26,500 tons ships at present building for the South American passenger service of the Cosulich Co., and which will have 24,000 aggregate i.hp. in two engines with 8 cylinders each, similar to those of ASTURIAS of the Royal Mail Steam Packet Company but having a greater output owing to the fact that the injection air compressors are to be separately driven. A considerable increase over this power will be necessary in order to drive the two new ships of greater tonnage at 24 knots, and probably a quadruple screw arrangement will be adopted.

# Fleet of Modern Ferries for New York

Diesel-Electric Boats of the New Ferry Company Make the  
Steam Ferries Look Like Back Numbers

**E**LECTRIC Ferries, Inc., demonstrates in the design of its new Diesel electric ferries for the Hudson River that economy is only one of the attractive features of the Diesel engine and that some of its greatest benefits are to be derived from the improvements in hull design and arrangements which it renders possible. A Diesel engine in a hull designed for steam will give economy, but a Diesel engine in a hull adapted to this modern style machinery will provide economy in operation plus increase in earning capacity.

## Chief Characteristics of Ferries

Length overall	155 ft. 0 in.
Length b.p.	131 ft. 0 in.
Breadth, overall	48 ft. 6 in.
Breadth, molded	37 ft. 0 in.
Depth, molded	14 ft. 3 in.
Draft	8 ft. 6 in.
Displacement	about 500 tons
Power of electric motor	580 s.h.p.
Speed	nearly 13 m.p.h.

In the new Diesel-electric ferries the hull proportions are different from those which rule for steam ferries. The draft is considerably less and the beam is greater. On the deck there is a very noticeable saving of space due to the abolition of the usual trunk for the boiler uptake and engine-room ventilation, its place being taken by two very narrow trunks on both sides of the center vehicle lane. These narrow

trunks are reduced to the minimum that will comply with the regulations of the Steamboat Inspection Service, having companion hatches to serve as emergency exits for the engineers. Buses or heavy trucks will be parked in the center lane of the five lanes on deck, where it can be strengthened by fore and aft girders and pillars.

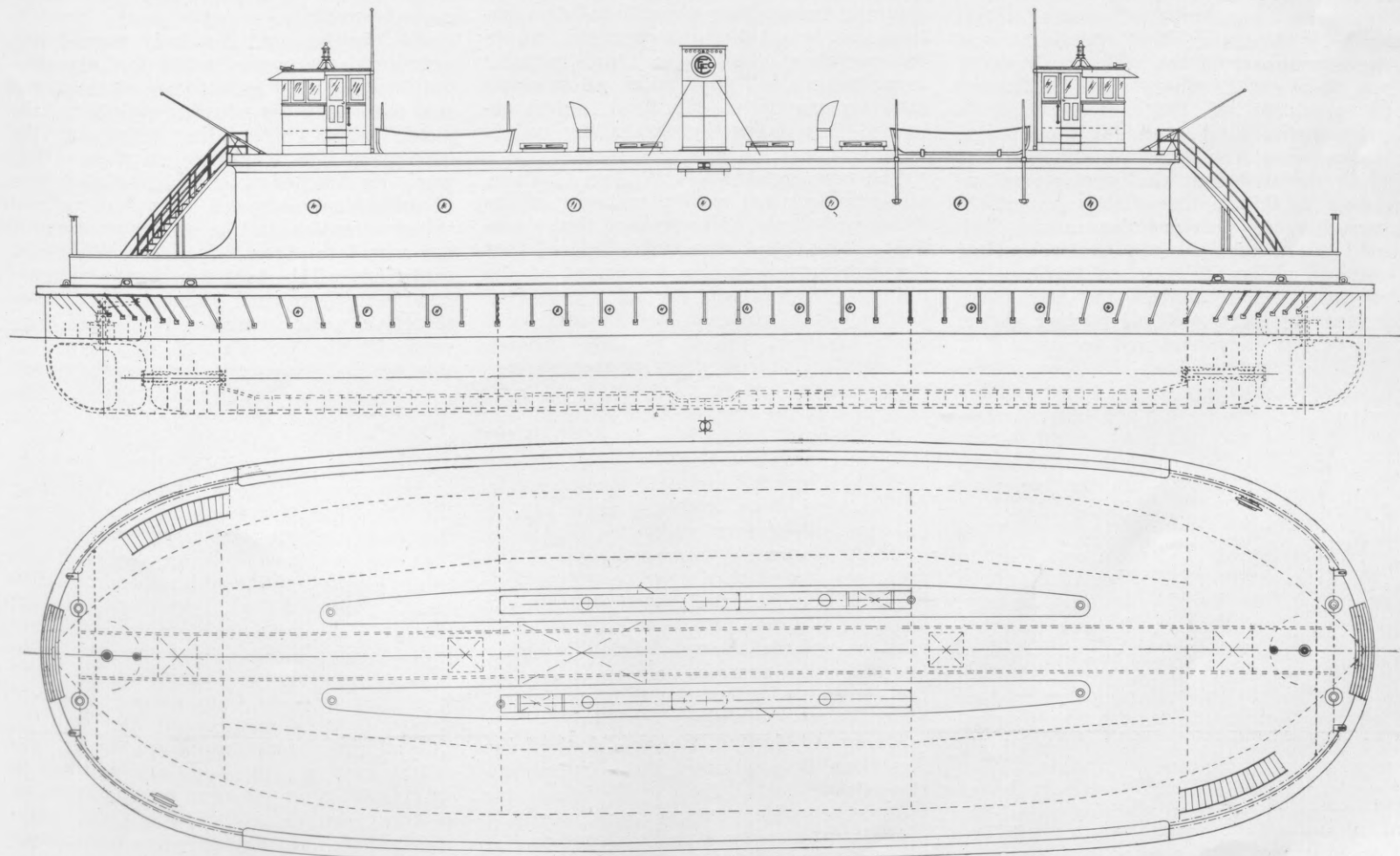
In order to get 13 miles per hour from these boats the power per ton displacement is slightly higher than in the usual Hudson River steam ferryboats. The Diesel-electric ferries will have about 1.16 s.h.p. per ton displacement compared with about 0.85 s.h.p. per ton displacement in the modern steam ferries. Tests made in the experimental model basin in Washington have indicated that a speed of 12.6 miles per hour should be obtained from the Diesel-electric boats.

Contracts for the six boats planned as the initial venture of Electric Ferries, Inc., were due to be let the latter part of last month. The shipwork is to be entrusted to the American Brown-Boveri Electric Corp. of Camden, N. J., which has cooperated with Eads Johnson, marine engineer and naval architect of New York, in the model tests of the hull he designed. The electrical machinery and equipment will be of Brown-Boveri type, and the Diesel engines will be built by the New London Ship and Engine Co. The first two boats will be in operation by Oct. 1.

Two generator sets will be installed in each boat. They will consist of a 6-cylinder M.A.N.-type airless-injection engine of 350 b.h.p. turning at 280 r.p.m. and direct connected with a 240 kw. 250 volt d.c. generator and a 35 kw. exciter. For propulsion a double armature electric motor of 580 s.h.p., operating at 500 volts, will drive a propeller at each end of the boat, the propeller shaft speed being 180 r.p.m. Electric current for lighting and for the auxiliary pumps will be taken from the exciters, and when the main engines are shut down the power for these purposes will be furnished by a 15 hp. auxiliary generator set, direct connected also with a bilge pump and with a compressor to replenish the starting air.

Advantage is taken of the Diesel-electric system of propulsion to give the pilot just as full control of the propelling machinery as he has of the rudder, enabling him to berth his boat in the slips much more easily.

Those responsible for the policy and operations of Electric Ferries, Inc., are George E. Barrett and Elmer Dittenbach, partners in G. E. Barrett & Co., bond brokers; John J. Mantell, vice-president of the Erie Railroad, who was director of railroad traffic in the Port of New York during the war; Lawrence Wilder, president of the American Brown-Boveri Electric Corp.; E. Victor Crawford of Hunt, Hill and Betts, admiralty lawyers; and Carroll E. Winslow, president of the company.



Outward profile and deck plan of the design of ferryboat adopted by Electric Ferries, Inc., for its Hudson River service

# Create Popular Support for Shipbuilding

Atlantic Coast Shipbuilders' Association Calls on All Marine Men to Assist in Educating the Public

LEGISLATION to stimulate construction of American ships by applying the tariff to shipping, through rebates paid from profits growing out of the operation of the Panama Canal, has commanded active support from all branches of American shipping and is widely regarded as a practicable method of solving the problem of keeping the American flag flying in overseas trade and in placing the shipbuilding industry on a more secure and profitable basis. The Pepper Bill, known as the Overseas Trade Act of 1926, has been drawn as the instrument for such legislation and has been given a hearing before the Senate Committee on Commerce and the House Committee on the Merchant Marine. There is little likelihood that the Bill can be advanced this session, but everyone should call upon his Representative or Senator to get behind it at the next session of Congress.

At the ninth annual meeting of the Atlantic Coast Shipbuilders' Association in Philadelphia last month particular emphasis was laid by speakers on the favorable reception accorded the Bill at the recent hearing before the Senate Commerce committee in Washington, where spokesmen for the measure representing substantially all of the major branches of the shipping industry appeared in support of the measure.

George W. Dalzell, of Washington, counsel for the Atlantic Coast Shipbuilders' Association, was the first speaker introduced by J. Harry Mull, president and general manager of the William Cramp & Sons Ship and Engine Building Company and president of the Association. In stressing the vital need for government encouragement for American shipping Mr. Dalzell declared that the principle of regarding a ship as essentially an export commodity, as provided for in the Bill, would serve to apply to the output of American shipyards a sound tariff policy that has been recognized for more than 50 years by both political parties as the basis of our industrial and economic life.

Stating that American shipping is now burdened with heavy production costs because of the protection given other American industries through heavy tariff duties, and is therefore penalized to substantially the same extent as though the materials entering into ship construction had had import duty paid on them, Mr. Dalzell declared that the shipowners are entitled to relief through the application of the tariff principle to the building of new tonnage. He pointed out that the Pepper Bill provides a sound and constructive method of relieving the shipping industry of this unfair discrimination, and said that its passage into law would reduce the original capital investment in new tonnage for overseas trade to such an extent that American ships so built would be better able to meet the keen competition of the ocean commerce of the world.

Mr. Mull, before introducing the next speaker, directed the attention of the mem-

bers present to the very able manner in which the Pepper Bill had been presented before the Senate Committee. He said that all of the Senators present showed deep interest in the bill and some of the committee frankly conceded that the measure appealed to them strongly as a sensible means of helping to solve America's shipping problem. He also stated that it was most encouraging to find that members of the committee were heartily in favor of doing something to help our overseas trade. Mr. Mull urged the members not to forget the significant statement of the chairman of the committee who said that while there

## Line Up Support

Now is the time for you to write to your Congressman and State Senator stating that you expect him to vote for the Pepper Bill when it comes up at the next Congress and urging him to recognize the patriotic need of applying the fundamental national tariff protection to the shipbuilding industry. Write also to your local Chamber of Commerce asking for its support.

was much sympathy in Congress for shipping legislation it was necessary for the shipping industry to direct legislative enthusiasm into the right channels and to do everything possible to create popular support for a bill upon which all shipping interests can unite. Mr. Mull said he regarded this suggestion as sailing orders that could not be ignored.

The next speaker was William G. Cox, vice-president and general manager of the Pusey and Jones Company and first president of the Association, who declared that the best way to insure enactment of the bill by Congress was for all branches of the shipping world to get together and work together, for it is only through united effort skilfully directed and courageously carried on that popular sentiment favorable to the bill could be obtained.

H. Birchard Taylor, vice-president of the William Cramp and Sons Ship and Engine Building Company and a former president of the Association, said that there can be no genuine prosperity in the shipyards until American shipping gets out of the doldrums and reaches a secure and profitable condition. He declared that American ships were cargo getters as well as cargo carriers, and that the upbuilding of a strong and successful overseas transportation system constituted a first charge upon our traditional resourcefulness.

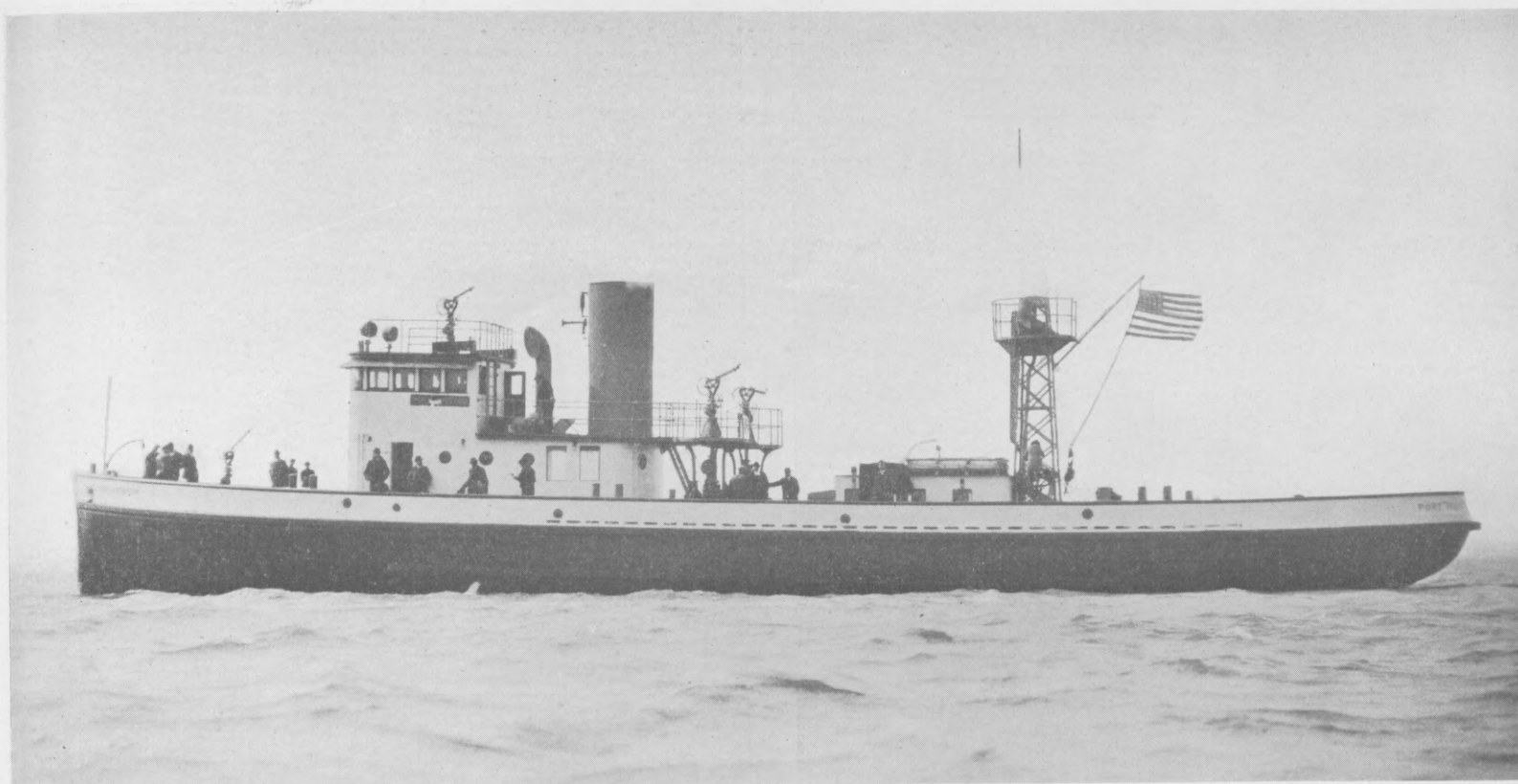
Harry A. Magoun, vice-president of the American Brown-Boveri Electric Corporation, declared that the Pepper Bill is the most practicable measure for the aid of American shipping ever developed and if properly handled will command sufficient support for its passage by Congress.

Mr. Mull took occasion at this point to decry the tendency so prevalent among those little versed in shipbuilding to look upon small scattered orders for new tonnage as an indication of prosperity in the shipyards. He drew the attention of the members to the small actual volume of work in hand throughout the country. He said the failure of the Government to appropriate funds for the construction of the eight scout cruisers necessary to complete the naval program was most shortsighted and has been an added blow to the shipyards. Had those contracts been awarded, he said, our major shipyards would have been provided with work for several years. Mr. Mull deplored the unhappy outlook, and declared that unless some piece of legislation such as the Pepper Bill is passed shipbuilding will become a lost art. He suggested that something might be done to stimulate public interest in the shipping problem through the radio.

H. G. Smith, vice-president of the Bethlehem Shipbuilding Corporation, stated in his opening remarks that the introduction in Congress of the Pepper Bill had brought a more encouraging outlook to the industry. "I believe that a very favorable impression was made before the Senate Committee on the Pepper Bill," continued Mr. Smith. "Shipping must have aid from the Government. This has been so often deferred that now the need is imperative. We are faced with a very grave condition and it must be met."

Mr. Smith stated that only a small percentage of the people realize that the shipbuilding industry is in such bad shape and said the industry should explain to the public what shipbuilding means to the country as a national asset in peace and in war. He touched upon the gradual decline of individual shipyard organizations and called attention to the drifting away of key men into other industries. Mr. Smith said many of the best men in the industry had been developed through naval construction work furnished to private shipyards by the Government, and now that this work has practically ceased he felt very dubious about the possibility of training men to take the places of those who have left.

L. H. Korndorff, vice-president and general manager of the Federal Shipbuilding and Dry Dock Company, expressed his enthusiasm for the Pepper Bill and declared that real results could be accomplished only through personal effort by everyone interested. He said the task of putting the Pepper Bill through Congress required that the idea be sold to the people, to individual members of Congress, to the farm organizations and to the various industrial groups. He complimented the Atlantic Coast Shipbuilders' Association on the excellent work already done and referred to opportunities for further valuable service. In conclusion Mr. Korndorff said the shipbuilding industry should take a much more aggressive attitude in placing facts affecting its welfare before the public.



*Port Houston, new style fireboat, built at Wilmington, Del., will be delivered under her own power at Houston, Tex.*

## New Style Fireboat is Diesel Electric

Port Houston, First of this Type, is Demonstrated to 200  
Fire Commissioners at Atlantic City

**L**AST word in fire-fighting vessels, the PORT HOUSTON, a powerful Diesel-electric vessel, was demonstrated before more than 1,000 delegates to the Annual Convention of the National Fire Protective Association at Atlantic City last month. The delegates included about 200 fire commissioners from all over the United States. The vessel was thrown open for their inspection and later was put through a variety of maneuvers and pumping demonstrations to show that the Diesel-electric system responds better to all the requirements than any steam or gasoline installation.

A profile and hold plan of the boat were published in the April issue of MOTOR-

SHIP with a description of the principal features of the machinery and of its arrangement. She is 125 ft. 10 in. long overall, 27 ft. 0 in. beam and with a draft of 8 ft. 6 in. Her power equipment consists of two main and one auxiliary generating units. The main sets are composed each of one 500 hp. 6-cylinder Diesel engine turning at 420 r.p.m. and direct connected with a 350 kw., 500 volt generator and a 25 kw., 125 volt exciter. The auxiliary set consists of a 165 hp. 6-cylinder Diesel engine turning at 425 r.p.m. and direct connected with a double generator having a total capacity of 100 kw. at 270 volts and belted to its 10 kw. 125 volt ex-

citer at the higher speed of 720 r.p.m.

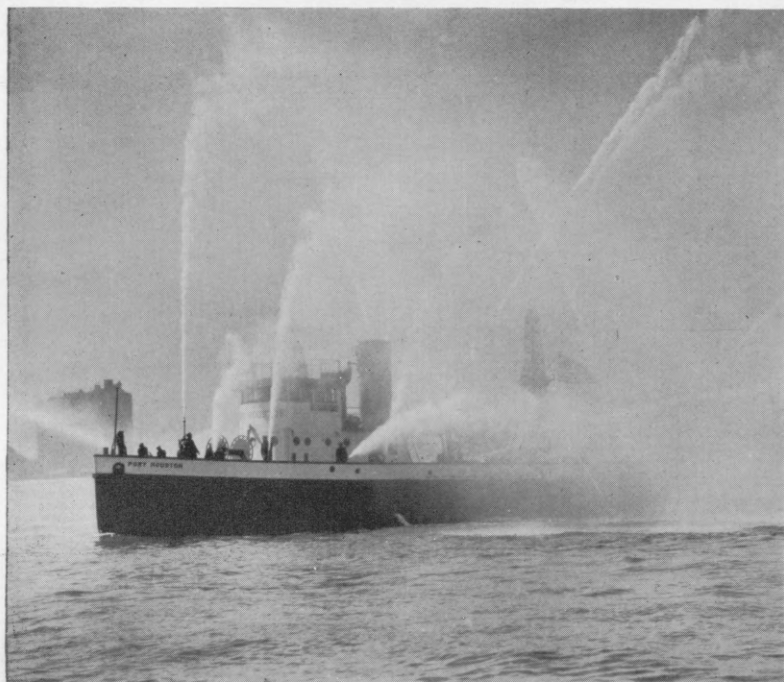
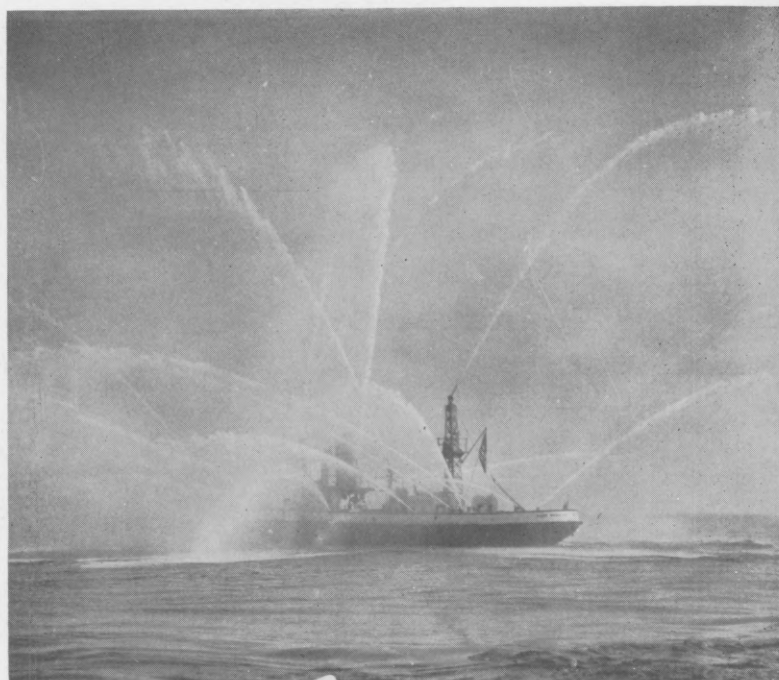
These three sets constitute a power plant which serves the double purpose of providing electric power for propulsion and electric power for pumping. To all intents and purposes the PORT HOUSTON is an electric fireboat with electric power furnished by a Diesel-driven generating plant. For propulsion two electric motors of 260 hp. each are used, turning at a maximum of 265 r.p.m. For pumping, two 410 hp. electric motors are used, direct connected with centrifugal pumps and delivering their rated capacity at 175 r.p.m. The main propulsion motors as well as the main pump motors operate on the 500 volt cir-



1500 gal. per min. from 1 3/4 in. nozzle

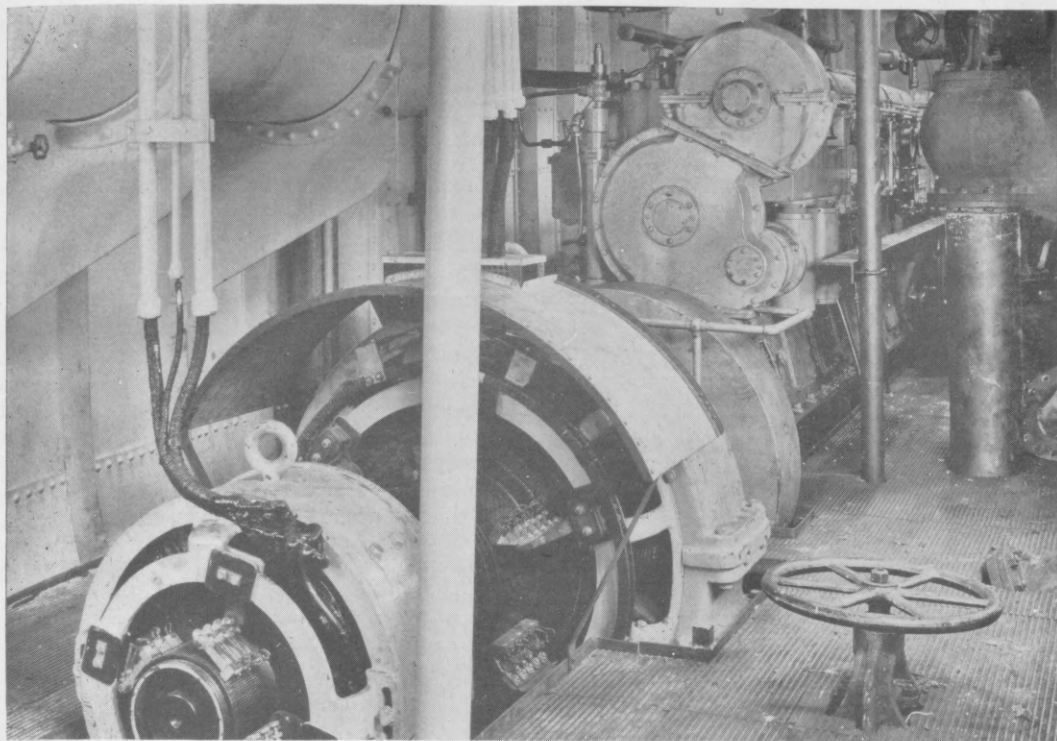


800 lb. pressure on the gage



**Demonstration of Diesel-electric fireboat Port Houston at work**

*A nozzle capacity of 8300 gal. of water per minute is registered by this new style fireboat, which can fight fire from both sides and at practically every angle with her 39 powerful streams of water while the ship is maneuvering at low speed*



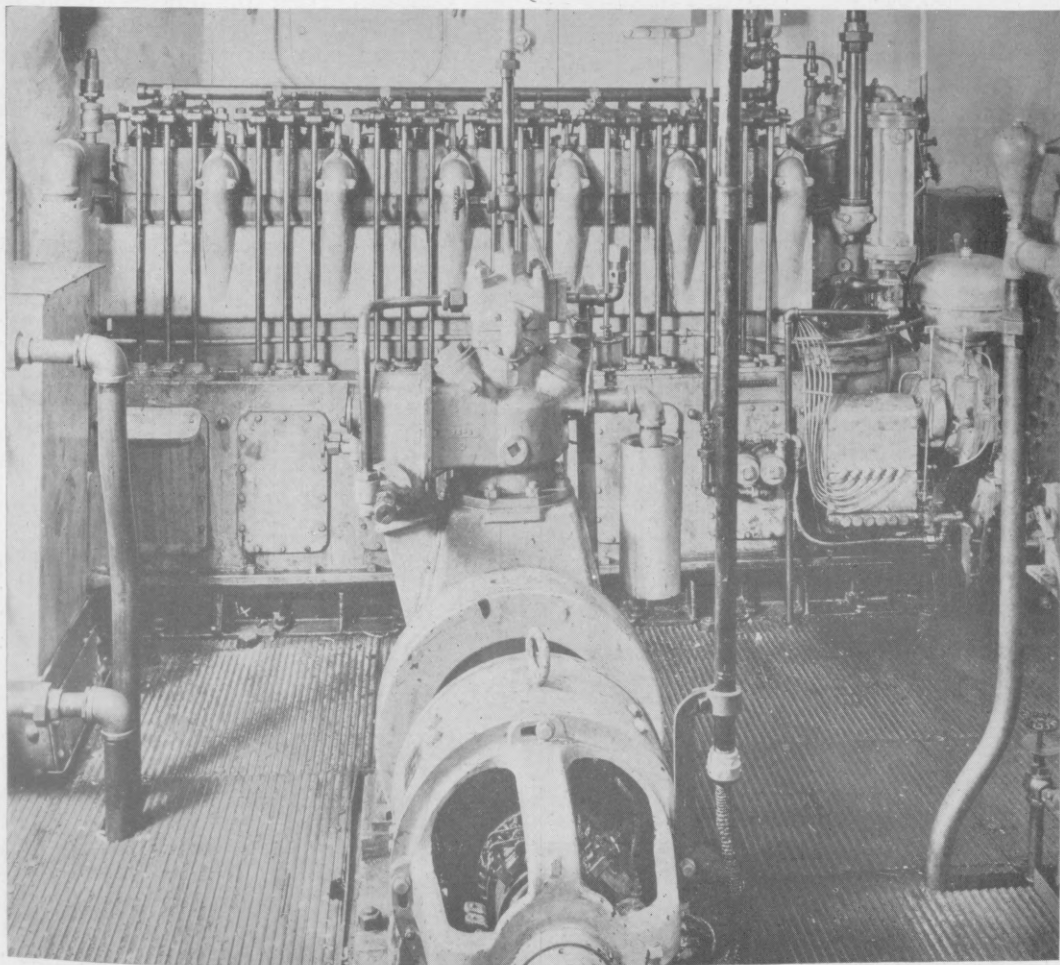
*One of the main 350 kw. generator sets supplying current for propulsion and pump operation*

cuit. The power available from the main generators is not sufficient to take care of all these motors at any one time.

The underlying idea of the installation is that maximum power will be available for propulsion when the boat is hurrying to a fire and that full power will be available for the pumps when the fireboat arrives at the scene of operations. This still leaves the maneuvering of the boat at the fire to be taken care of, and it is for this purpose that the auxiliary generating set

has been installed, namely, it provides a total of 100 kw. which can be split up between the twin propelling motors to operate them at reduced power and speed when the power from the main generating sets is being completely utilized in the pumps. The three Diesel engines are all of Winton make; the electric equipment has been supplied by the Westinghouse firm and the big pumps are of Worthington manufacture.

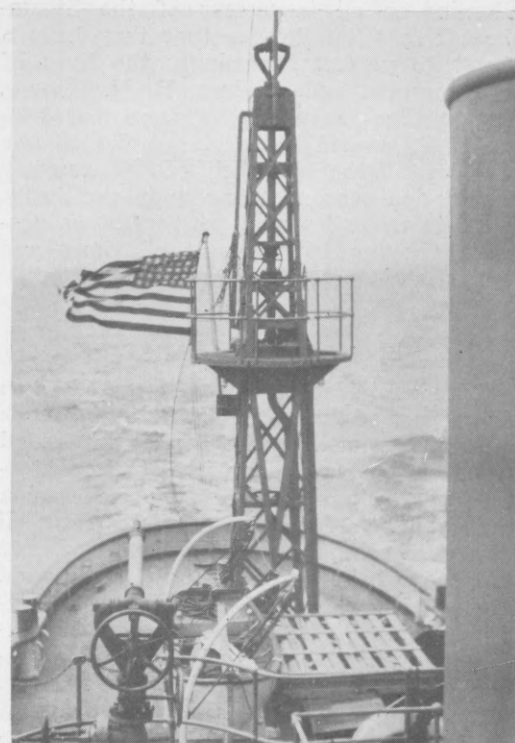
These two big pumps can supply 3,500



*A 100 kw. auxiliary generating set driven by a 6-cylinder Diesel is arranged athwartships*

g.p.m. at a pressure of 300 lb. per sq. in. or a maximum of 7,000 g.p.m. at 150 lb. per sq. in. Altogether there are 39 nozzles distributed around the boat, and when water is being pumped through all of them simultaneously it represents something like a cloudburst. All these nozzles can be brought to bear in any direction or they can play their streams in different directions.

All the fire commissioners at Atlantic City were greatly impressed by the demonstration of the PORT HOUSTON and by the realization that she incorporates greater efficiency as a fire-fighting unit than any piece of floating fire equipment that has yet been built in the world. Not only does she perform all that could be accomplished with a steam fireboat or with a steam-electric fireboat, but she achieves it also at a greatly reduced cost, notwithstanding the slightly increased capital investment which she represents. There are, of course, no



*Mast hinges at platform*

standby losses in her and yet she is instantly available to respond to any fire call and can get under way as fast as the crew can get to its stations.

In point of maneuverability she represents, of course, the practical zenith. Nobody can deny that in this respect electricity is much handier than either steam or the straight drive of internal-combustion engine. Intrinsically her own fire hazard is a minimum, because she uses for fuel not a highly inflammable liquid like gasoline or a moderately inflammable fluid like kerosene, but a grade of fuel oil generally regarded as having a very small fire risk. It does seem a little strange, however, that a ship of this character, which will be called upon to fight fires in fairly restricted areas in a big oil shipping port where burning oil may escape from shore tanks and form an extra hazard on the water, is not herself protected against fire.

The Harris County Houston Ship Canal Navigation District Commission are the owners of the ship, which was designed by Cox & Stevens of New York and built by the Bethlehem Shipbuilding Corp. at the Harlan yard at Wilmington, Del.

**M**OTORSHIP has changed the location of its offices to 220 West 42nd St., New York, N. Y.—telephone Wisconsin 2053. Make a note of the new address and phone number.

GULFPRIDE is to be the name of the motor-tanker of 15,000 tons gross now constructing at the plant of the Federal Shipbuilding and Dry Dock Co., Kearney, N. J., for the Gulf Refining Co. She will have a length of 525 ft., a beam of 74 ft. and a depth of 40 ft. 6 in., and will be powered by two Bethlehem engines.

The Coast Guard cutter BEAR left San Francisco on May 5 on her final trip to Alaska. She will be relieved next year by the new vessel described fully in March MOTORSHIP. The NEW BEAR will have Diesel-electric propulsion.

Reminding all inspectors of the Steamboat Inspection Service that they have a trust to perform, involving the lives of men, women and children, D. N. Hoover, supervising inspector general of the S. I. S., issued a circular letter to the Service at the approach of the summer navigation season calling upon the entire staff to make its work as perfect as possible "having in mind, at all times and before all things, the thought of safety."

### Freeboard of Tankers.

Oil tankers' freeboard was discussed when the report of the Technical Sub-Committee of the International Oil Tanker Freeboard Committee was dealt with at the International Shipping Conference in London on April 14, 15 and 16, delegates from all parts of the world attending. James Kennedy of the Gulf Refining Company and Robert Hand of the Standard Oil Company of New York contributed to the discussion. The matter has been under consideration for a number of years. Because European shipowners obviously could not have records of "overloading," the International Committee asked the American sub-committee to enquire into and report upon the experience of American owners with regard to loading. A record of 10,000 voyages showed that oil tankers had been, according to foreign standards, "overloaded" to the extent in some cases of 45 per cent of their freeboard without a single case of damage, and the American Technical Committee therefore contended that it would be perfectly safe for foreign countries to reduce freeboards by 21 per cent on large tankers. The International Committee, however, wished to compromise by recommending a reduction of 15 per cent. The American technical sub-committee has agreed to this. Under the load-line Bill now before Congress with a chance of becoming law by the Fall, the Department of Commerce will have authority to assign loadlines, and the new law will effect all ships loading abroad for United States ports and also in United States ports for abroad. American ships will be able to load less oil for abroad and foreign ships will be enabled to load deeper, but this cuts both ways because American oil companies own a number of tankers under foreign flags and the status quo will be maintained in the coastwise trade.

# Motorship

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Readers are invited by the Editor to submit articles, photographs or drawings relating to motorships, marine oil-engines or auxiliaries. Contributions used in the magazine are paid for on the 15th of the title month of issue, and other contributions are returned as promptly as possible.

SIROCCO, one of this year's new Diesel yachts, was due to start across the Atlantic last month, her owner, Francis S. Whitten of New York, having planned to join her in British waters this month. She is 120 ft. long, 20 ft. 6 in. beam and draws 5 ft. 6 in. Her propelling machinery consists of two 175 hp. Winton engines, which drive her at about 13 knots. She was built by the Luders Marine Construction Co. at Stamford, Conn.

### Re-engining of United Fruit Co.'s Diesel-electric Ships

Decision is reported to have been made by the United Fruit Company to buy in Italy eight Diesel engines of 800 b.h.p. each to replace the present engines of its two Diesel-electric fruit carriers LA PLAYA and LA MAREA. During the last two years rumor has frequently credited the United Fruit Co. with the intention to convert these vessels to steam. The vessels were built in 1923 in Great Britain, but their commissioning was greatly delayed by engine troubles, and ever since they were placed in service they have made frequent visits to the repair yards. They are 14-knot ships of 4000 tons d.w.c. with 150,000 cu. ft. chilled hold capacity. The Diesel-electric system is ideally suited for LA PLAYA and LA MAREA, but the engine troubles gave the electric system a set-back. With dependable Diesel machinery their success will be insured.

Radio direction finding apparatus was reported to be in use on 263 British ships at Dec. 31, 1925.

"Steer so and so 'gyro'" has become a conning instruction in as frequent use on the Great Lakes as on ships plying the earth's larger bodies of water. The gyro-compass has become recognized by progressive ship operators on the Lakes as of great advantage to them in maintaining their high standards of efficiency and security of investment. Over 40 vessels, one of which is a tug, received gyro-compass installations during the past winter. The gyro-compass is popular among ship's officers because it simplifies their problems and gives them a steady and reliable compass regardless of the rapid and frequent changes in the earth's magnetic field about the Lakes.

Ten delegates represented United States interests at the International Shipping Conference in London last month. Representing the American Steamship Owners' Association were Paul S. Harwood (vice-president of the A.S.O.A.), Robert F. Hand (asst. marine manager of the S.O. Co. of N. J.), James Kennedy (marine manager of the Gulf Refining Co.) and Ira A. Campbell (counsel to the A.S.O.A.), with Sir Joseph Isherwood as technical adviser. Commissioner E. G. Plummer attended for the Shipping Board, and the U.S.S.B. Emergency Fleet Corporation was represented by Capt. W. F. Purdy, Capt. P. C. Grening, G. B. Moore and L. E. Anderson.

### Another S. F. Bay Tanker

Diesel electric propulsion has been adopted for RICHLUBE, an oil barge for service on San Francisco Bay ordered by the Richfield Oil Company from the Potrero plant of the Bethlehem Shipbuilding Corporation. She is practically identical with the tank barge GENERAL completed towards the end of last year by the same company for the General Petroleum Corporation and described in Feb., 1926, MOTORSHIP.

RICHLUBE has 7000 bbl. capacity compared with GENERAL's 6000 bbl. and a length b.p. of 180 ft. 6 in. as compared with GENERAL's 170 ft. A further difference occurs also in the cargo pump capacity, RICHLUBE having two 1200 bbl. per hr. Northern rotary pumps in place of GENERAL's two 1000 bbl. per hr. units of similar make. These pumps are driven by 60 hp. Westinghouse motors located in the engine room, the shafts passing through stuffing boxes in the bulkheads.

#### Characteristics of Richlube

Length, b.p. ....	180 ft. 6 in.
Breadth, molded .....	32 ft. 4 in.
Depth, molded .....	14 ft. 0 in.
Capacity .....	7,000 bbl.
Power of main engines (2) .....	500 b.h.p.
Power on main generators (2) .....	290 kw.
Main propelling motor.....	350 s.h.p.
Propeller revolutions.....	160 r.p.m.

Two 6-cylinder 250 b.h.p. Atlas-Imperial Diesels are direct connected with two 145 kw., 250 volt Westinghouse d.c. generators and 20 kw. Westinghouse exciters. The main propelling motor is of Westinghouse double armature type of 350 s.h.p. at 160 r.p.m. The speed of this motor is varied from the pilot house by a variable voltage control.

REGINOLITE and CLIO are two tankers of similar dimensions and power built by the Vulcan Werke, Stettin, 470 ft. long, 62 ft. breadth, 35 ft. 6 in. depth and 12,000 tons d.w.c. with M. A. N. 2-cycle single-acting engines of 3,000 shp. on twin screws. The REGINOLITE is for the Imperial Oil Co. of Canada and the CLIO for the Baltisch-Amerikanische Petroleum Import A.G. of Danzig, both subsidiary companies of the Standard Oil Co. (N. J.)

Construction of three transpacific motorliners for the Nippon Yusen Kaisha is to be started almost immediately. They are to be 14,000 ton ships costing about \$4,500,000 per ship and Diesel engines will give them a speed of 17 knots. The owners plan to cut down the time between Yokohama and San Francisco from 17 days to 15 days. A subsidy has been granted by the Japanese government to the N.Y.K. for this construction.

### Canadian Pacific Motorships.

The revolution which the motorship is causing in shipping is indicated in the annual report of the Canadian Pacific Railway for 1925, wherein it is stated that the maximum economy of operation can only be secured by adding fast and up-to-date ships to fleets, since shippers are naturally giving preference to modern ships which ensure rapid movement of their merchandise, and in consequence, a quick turnover of capital. The Canadian Pacific Company plans therefore to construct two new passenger vessels of MONTCLARE type (16,319 tons gross and 16 knots speed) for the transatlantic service between Canada and Europe. Bidders have been asked to quote alternatively for geared turbines and Diesel engines. The company plans also to build five 8500 ton freighters with a sea speed of not less than 14 knots.

Diesel engines have been selected as the motive power for a submarine depot ship to be constructed for the British Navy.

Five submarines were stationed at the Victoria Docks, London, to provide electric power for the cold storage warehouses, pier lighting and cranes during the recent general strike in Great Britain.

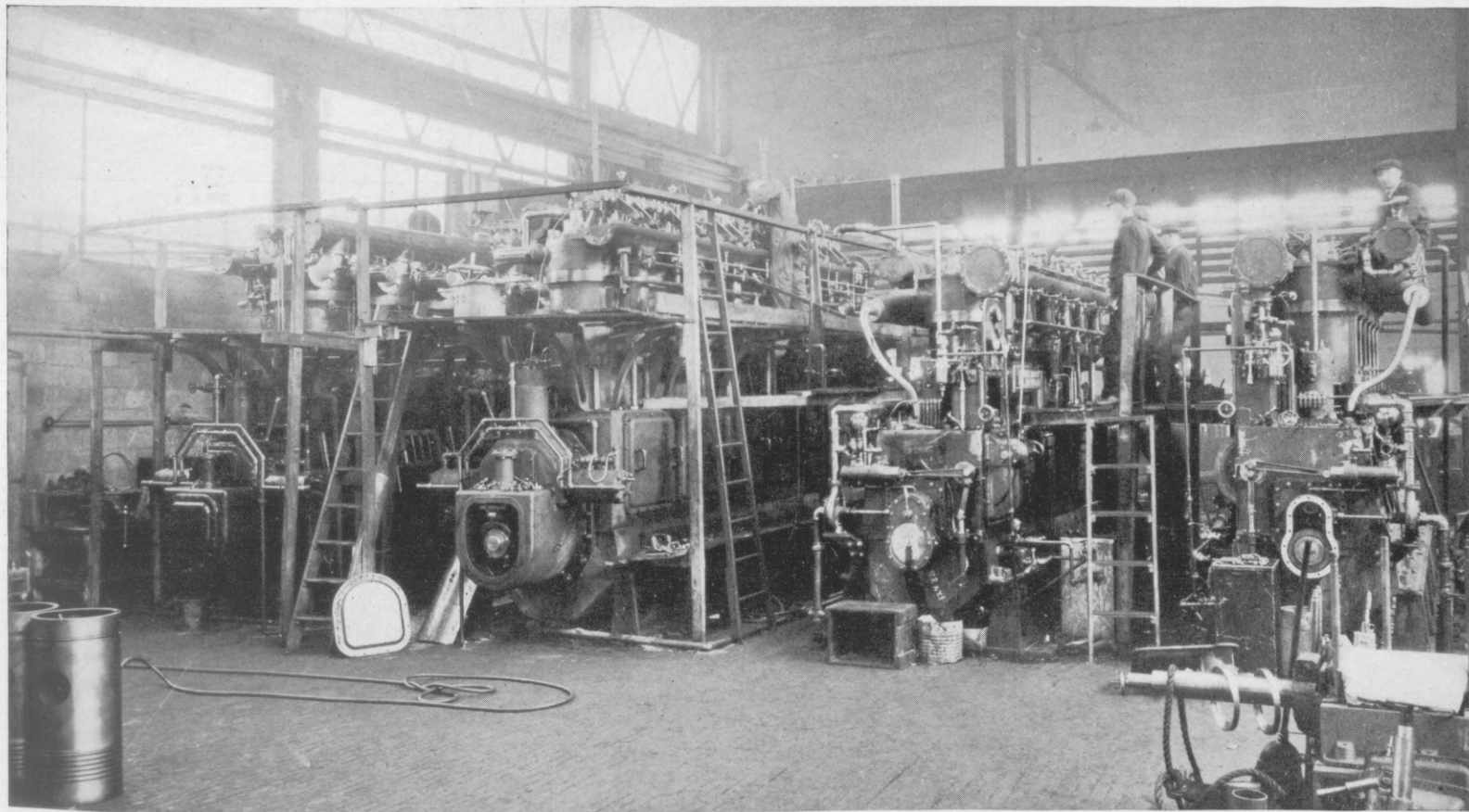
A new building of 43,480 sq. ft. area was completed last month at the plant of the Bessemer Gas Engine Co. for the erection of Diesel engines. Over each assembly stand is an electric jib crane which facilitates quick handling of the material in process of assembly. Serving each bay is an electric traveling crane. The largest crane is of 50 tons capacity and can handle all engines completely assembled with the exception of the flywheel, so that they can be shipped complete after leaving the test stand.

For J. L. Livermore's new yacht ADHERO II, building at Lawley's yard to designs by Henry J. Gielow, Inc., the two 800 hp. main engines and the 60 hp. auxiliary engines were shipped some time ago from the Bessemer Works. The main engines, which turn at 250 r.p.m., weight 99,000 lb. each, exclusive of thrust and compressor, equivalent thus to about 125 lb. per b.hp. They are of the reversing type, with airless injection, reversing being accomplished by means of air-hydraulic rams and controlled by a single lever. Air for starting and reversing is supplied by three single-stage compressors operated by an air clutch. These two engines are shown on the left in the illustration on this page. The other two engines in the picture are of 420 b.hp. for the Gielow designed yacht building at Todd's Brooklyn yard to the order of D. P. Davis.

Both the House and the Senate in Sweden voted without debate the appropriation for the loan to the Swedish American Line to assist in the construction of a sister ship to the motorliner GRIPSHOLM.

SUEJA III, the new Diesel powered yacht for Capt. James Griffiths, Admiral of the Pacific Coast Yachting Association, has been launched from the Winslow Marine Railway & Shipbuilding Co.'s plant. The new vessel is 170 ft. long and has been powered with twin 180 hp. Washington-Estep Diesel engines.

Election of officers of the Atlantic Coast Shipbuilders Association for the coming year was featured by the re-election of J. Harry Mull as president and of Ernest Lee Jahncke as vice-president. Mr. Mull is the energetic president of the Wm. Cramp & Sons Ship & Engine Building Co. and Mr. Jahncke is president of Jahncke Dry Docks Inc., of New Orleans. W. G. Coxe, first president of the Association, was elected as treasurer and Clarence Samuel King, who has been identified with the Association since the start, was re-elected secretary. The election, from the various shipbuilding districts along the Atlantic and Gulf coasts, of councilors to compose the governing body of the Association for the coming year resulted as follows: New England Section, E. B. Hill, Bethlehem Shipbuilding & Dry Dock Corporation, Ltd.—New York Section, L. H. Korndorff, Federal Shipbuilding & Dry Dock Company; William G. Coxe, Pusey & Jones Company, and W. G. Groesbeck, American Brown Boveri Electric Corporation—Southern Section, F. P. Palen, Newport News Shipbuilding & Dry Dock Corporation—South Atlantic and Gulf Section, Ernest Lee Jahncke, Jahncke Dry Docks, Inc.



Two 800 hp. engines and two 420 hp. engines, all for yachts, on the test-floor at the Bessemer engine works

## "The Future Is with Motorships"

IN somewhat the same way as in recent years the horsedrawn vehicle has been replaced by the automobile, the motor driven vessel is steadily, if slowly, replacing the vessel fitted with steam engines in many trades, stated Lord Kysant at the recent annual general meeting of Harland & Wolff, Ltd., the famous shipbuilding and marine engineering firm of Belfast.

"A change has been gradually taking place in the shipping world which many people still ignore, but in my opinion they will have to face the hard facts in the course of the next few years," he said. "Already despite the surplus tonnage afloat, there is a demand for motor driven vessels to replace steam tonnage. The mere fact that the advocates of steam engines are endeavoring to devise means to meet the competition, or reduce the disparity of efficiency, between the two systems is an indication of the concern that is felt by those (a diminishing number) who still have a predilection for steam propulsion on many of the most important trade routes.

"While our company is equipped for the economical production of vessels of all kinds, with reciprocating engines, turbines or motors, I cannot but feel that the future on most routes is with vessels fitted with internal combustion engines, and therefore with our unrivalled knowledge and experience of this type of engine and our commanding lead in its production in this country, I believe Harland & Wolff hold the key to success in the latest phase of shipbuilding and marine engineering."

Lord Kysant, who succeeded Lord Pirrie as chairman of the big Belfast and Glasgow firm, which gave employment last year to an average of 38,000 men in its various plants, steel works and coal mines, is a remarkable successful shipowner, having during the last 20 years built up the Royal Mail Steam Packet Company group until it has become a fleet exceeding 2,000,000 tons gross. His remarks to the stockholders of Harland & Wolff are to be read therefore as the views of not only one of Britain's leading shipbuilders but also as the opinion of one of Britain's foremost shipping men. In that light the following further extract from his speech assumes special significance:

"Your late chairman, Viscount Pirrie, who was not only a very able man, but, in my opinion, one of the most far-seeing men in the United Kingdom, took a keen interest in internal combustion engines from their earliest stage. Some 15 years ago Lord Pirrie had sensed the great possibilities of the motor-ship, and he obtained first-hand experience of different types of motor engines, which led him to the conclusion that the type which Harland & Wolff commenced building 14 years ago was the one which held out the most promise for the wide range of ships which the firm are called upon to build. The experience of these last 14 years, with such a large number of motor-ships built by Harland & Wolff actually in service, has amply justified Lord Pirrie's choice, as can be seen by the extent to which the same motor engine has also been developed in the hands of other licensees, the total number of ocean-going ships fitted with it being well

in excess of the combined total of ocean-going vessels fitted with all other types of motor engines. Thereby a great wealth of experience is brought to bear on the ships that are now being turned out—the latest and most interesting example being the Royal Mail motor vessel ASTURIAS, which has just completed a most successful round trip to and from South America.

"As I think everyone knows, the ASTURIAS is a twin-screw vessel fitted with our double-acting type of motor engine. The same type of motor engine is also installed in the CARNARVON CASTLE, the fine new vessel for the South African mail service, which is now nearing completion at Belfast; and completing alongside of her is the new West African mail boat ACCRA, also fitted with a somewhat smaller size of the same type of motor engine. The great economies that can be realized with this type of motor engine compared with the most modern oil-fired or coal-fired steamer are so considerable as to compel serious consideration of it by shipowners in connection with any new tonnage, and we feel confident that these large motor-ships will stand out in maritime history as epoch marking vessels. It is a veritable revolution in marine propulsion, and is a serious challenge to steam."

### Short Run Passenger Ship.

BRABANT, a new short-run passenger and cargo vessel of about 2000 tons gross, was placed in service recently between Oslo and Antwerp. She is the second motorship of this class to invade the North Sea services, which are usually regarded as a stronghold of the coal burning ship. Furthermore, it speaks well for the economy of the Diesel engine that a motorship should be considered profitable to operate between two ports at one of which British coal and at the other of which Belgian coal can be obtained relatively cheaply, whereas the Diesel oil has to be transported at least 4500 miles. BRABANT has accommodation for 70 first-class passengers amidships and for 30 third-class passengers aft. The machinery is amidships and there are two large cargo holds forward and aft. For power she has two sets of 6-cylinder B. & W. trunk piston engines, each developing 1150 i.h.p. at 150 r.p.m. The cylinders have a diameter of 19 11/16 in. and a stroke of 35 7/16 in. BRABANT was constructed by Akers Mek. Verksted, Oslo, for Ganger Rolf Akt., a subsidiary of Fred Olsen & Co.

ASTURIAS, the Royal Mail Steam Packet Company's new passenger motor liner, completed her maiden voyage when she arrived at Southampton, England, on May 6 from the River Plate.



*Nashville B, a sternwheeler described on the opposite page*

### New Australian Motorship

MUNDOO, third motorship for the Adelaide Steamship Co., Ltd., Adelaide, Australia, built and engined by Burmeister & Wain, Ltd., Copenhagen, is due to arrive at her home port in June after her maiden passage. The first motorship of this company, MULCRA, left England on Oct. 1 last, and her maiden passage to Australia via the Cape, some 20,000 miles accomplished in 58 days, was discussed in MOTORSHIP, Jan. 1926. MULCRA has a length b.p. of 215 ft., a deadweight of 1,450 tons and a power of about 750 s.h.p. at 125 r.p.m. MUNDOO is a larger vessel, having a length b.p. of 331 ft. a deadweight of 5,100 tons and a power of 2,500 i.h.p. at 95 r.p.m. She is driven by an 8-cylinder B. & W. engine with supercharger. All the auxiliary machinery is electrically driven, current being supplied by two 66 kw. and one 33 kw. generating sets.

### More Motor Tankers.

Contracts for seven tankers just placed in Great Britain by the British Tanker Company Ltd., include a 10,000 tons single-screw vessel to be constructed by Sir James Laing & Sons and to be fitted with Doxford opposed piston engines built by Richardsons, Westgarth and Co. This company has had a license for constructing the Doxford engine for some time, in addition to its Tosi license, but up to the present time it has not built any engine of the Doxford type.

Other orders in these new contracts include a 9100 tons d.w.c. tanker to be propelled by twin sets of Brown-Sulzer engines and a 10,000 tons tanker to be built by Lithgows and engined with a single set of B. & W. engines by J. C. Kincaid & Co.

Swan, Hunter & Wigham Richardson are to construct two 10,000 tons d.w.c. tankers, and Palmers Shipbuilding & Iron Co., a 6100 tons vessel.

# Sternwheel Diesel Towboat of 400 Hp.

New Mississippi River Tug Has Split Stern Wheel, Silent Chain Drive to Jackshafts and Reduction Gears

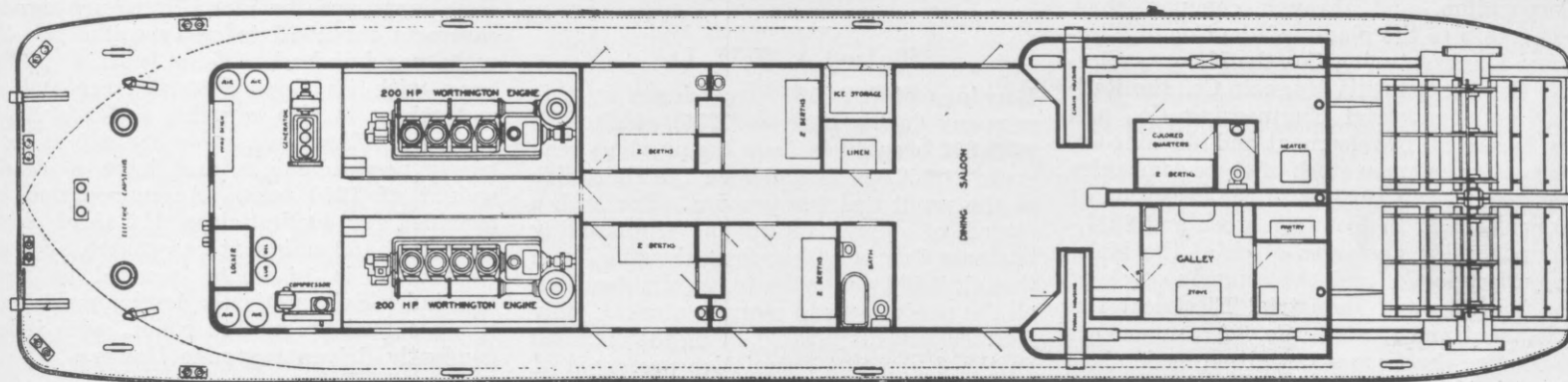
NASHVILLE B, a sternwheel Diesel towboat built by the Nashville Bridge Co. to demonstrate the economy and efficiency of that type of shallow draft river towboat, has now been completed, and is at work on the Mississippi River. She was designed by H. B. Dyer, marine engineer for the Nashville Bridge Co., and her service requirements were outlined by Mr. Dyer in MOTORSHIP for September, 1925.

The primary considerations were to obtain ability to back and flank a heavy tow

ton 200 hp. 2-cycle airless injection engines driving through lines of shafting to Link-Belt silent chains, which turn the jackshafts actuating the port and starboard paddles respectively, through bevel gear drives, one of which is illustrated in this article. The two wheels are each 15 ft. 4 in. diameter with 13 brackets 30 in. deep and 9 ft. 3 in. long, and turn at 23 r.p.m.

All shafting above the deck in the main cabin space of NASHVILLE B had to be avoided. In putting the shafting below the

deck, it was especially important to adopt a type of bearing which would require practically no attention. For this reason all bearings on the shafts below deck are self-aligning ball-bearings housed in oil-tight casings, which will require lubrication only once every three or four months and in addition will reduce the friction load of these shafts about 80 per cent. The interior jackshaft bearings, which are above deck and easily accessible, are standard self-aligning, ring oiling, babbitted bearings,



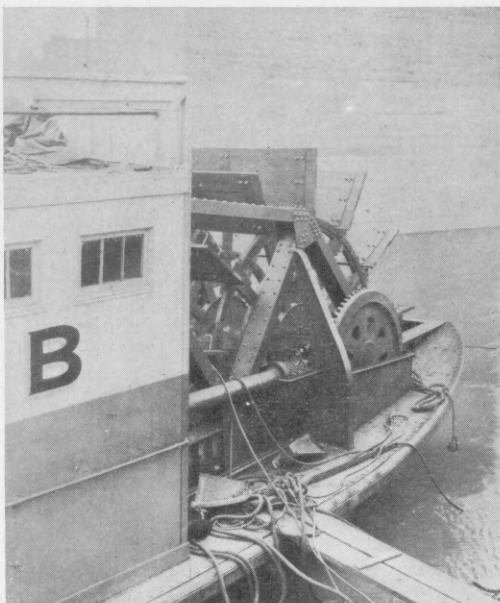
*Nashville B's main engines drive the jackshafts through silent chains. Jackshafts operate the split sternwheel through bevel gears*

and to find a power plant and transmission which would give the longest possible life with the least amount of attention and upkeep. These desiderata, it was considered, were best fulfilled by the Diesel engine in conjunction with a stern paddle wheel. Moreover, in order to gain the maximum maneuvering ability the sternwheel was arranged to be of independently operated type, i.e. split in two halves, one operated by each engine.

## Leading Characteristics of Nashville B.

Length overall .....	131 ft.
Width overall .....	30 ft.
Draft .....	3 ft.
Rake of stern .....	20 ft.
Diameter of wheels .....	15 ft. 4 in.
R.p.m. of wheels .....	23
Power .....	400 hp. collective

The main propelling machinery is situated, together with the principal auxiliaries at the forward end of the boat, and consists of two sets of 4-cylinder Worthing-

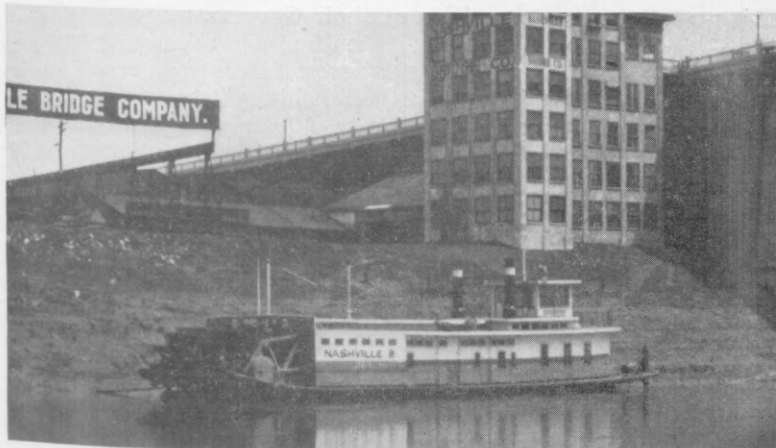


*Nashville B's wheel drive*

while the exterior bearings at the gears are special cast steel, bronze-lined bearings encased in an oil-tight casing and lubricated by a pressure oiling system which requires no attention except to keep a supply of oil in the case.

The auxiliary machinery in the engine-room comprises an air compressor and a fire and bilge pump. These are electrically operated, current being taken from a generating set operated by a Hill oil engine which has the economical advantage of operating on the same fuel as the main propelling machinery. Two electric capstans arranged forward with their controllers permit of a great saving of time in hitching up tows; for example, a barge can be pulled up tight with the two capstans and the boat can be gotten under way while the ratcheting up can be done later.

NASHVILLE B has a complete steel hull and a well modeled bow designed to prevent drift from going under the boat where there is a danger of it fouling the wheel.



*Split sternwheel increase handiness*



*Two electric capstans are forward*

## Financial Notes

### American Brown Boveri Electric Corp.

IN the first statement to stockholders of this corporation, which enlarged its activities in October 1925, the net income for the year ended Dec. 31, 1925, after depreciation and interest charges, but before provision for income taxes, was \$1,708,690. Net income from operations was \$1,254,290 and the rest was from investments. The consolidated assets of the Corporation amounted to \$36,788,399, while the total current assets were \$12,899,873. American Brown Boveri Corporation took its present title in October 1925 when Brown Boveri and Company Ltd., the well known Swiss firm of electrical engineers, extended its experience to the New York Shipbuilding Corporation, and through common stock ownership to the plants of the Condit Electrical Manufacturing Co., the Moloney Electric Co., the Scintilla Magneto Co., the Railway and Industrial Engineering Co., and the Electrical Development and Machine Co. The entire common stock of these companies was acquired in 1925, with the exception of 20 per cent of the common stock and \$217,400 par value preferred stock of the Moloney Electric Co. and the common stock of the Railway and Industrial Electrical Development and Machine Co. Arrangements to acquire the former have been made since Dec. 31, 1925, and the latter was taken over in Jan. 1926.

### Standard Oil Co. of California

Standard Oil of California made a net profit for the year 1925 of \$30,953,000, an increase of \$4,351,000 or 16.36 per cent over the previous year. This profit equals 9.29 per cent on the combined issued capital and book surplus of Dec. 31, 1925, and is equivalent to \$3.25 per share on the outstanding capital stock of that date as compared to \$2.83 per share for 1924. The company added to its inventories of oil during the year 11,781,263 barrels at a cost of \$14,305,568. On Dec. 31, 1925, a contract was entered into with the Pacific Oil Co. by which all the producing properties and lands of the latter were consolidated with the assets of the Standard Oil of California.

### Vickers, Ltd.

Vickers, Ltd. made a profit of \$2,104,865 in 1925, but no depreciation had to be provided on account of the drastic write-off already made in the reorganization. Dividends on preferred for the year amounted to \$2,013,490, but holders of the \$20,525,805 common stock received nothing. With a carry-over of \$862,500 from 1924, the profit and loss account was left with a credit of \$953,875. Since the previous report the assets have been written down by \$62,211,830 and the share capital has been reduced by 66 per cent.

### Swedish-American Line

Swedish-American Line fixed its dividend for 1925 at 5 per cent. Total income was \$1,439,260 as compared with \$925,672 for the previous year, and profits on the operation of the ships of the fleet were \$1,318,024, an increase of \$518,312 from 1924. A sum of \$289,820 was written off the tonnage

and \$131,080 off the stock. There was a net surplus of \$450,040, which, with a sum amounting to \$34,906 brought forward from 1924, gave a total of \$487,946, out of which a 5 per cent dividend, \$254,600, was paid and \$40,200 transferred to the reserve fund. The cost of GRIPSHOLM, which made one round voyage in 1925, was given as about \$3,735,920, and it was further stated that various special circumstances connected with the ordering of this vessel and with its building, which could not be expected to repeat themselves, were responsible for the fact that the cost could be limited to that figure. The title of the company was changed during the year from Rederei A. B. Sverige-Nord-Amerika to A. B. Svenska Amerika Linien.

### Harland & Wolff, Ltd.

Earnings of \$974,187 were shown by this company during the year 1925, which with \$608,852 brought in from the previous year made \$1,583,039 available on the right side of the profit and loss account. For such a period of depression in the shipbuilding business this is an excellent showing, even though it did not suffice to pay dividends on all the preferred and common stocks. Only \$951,295 was distributed, being the dividend on the 6 per cent cumulative preferred of \$19,440,000 par value. On the \$29,283,000 par value "A" preferred and common stocks the dividend was passed. A sum of \$631,744 was carried forward.

### Motorships Alter Economics.

Most of the new ships for which government money has been given or guaranteed in various countries are motorships of approximately 14 knots speed which will have relatively greater cargo space and higher speed and which will make competition more difficult for slower ships, stated J. B. van der Houven van Oordt, chairman of the Netherlands Shipowners' Association, at the annual general meeting of the members. This will have a depreciating effect on the value of slower ships. A few years ago 12 knots was considered a high speed for cargo liners, but now in order to hold the field many owners will have to face the need of disposing of comparatively new and costly vessels, which will be difficult because the financial results of the last few years have not always allowed provision to be made for such obsolescence.

"It is quite possible—and, personally, I believe it is probable—that many will live to see the time when steamships will have become as rare on the high seas as sailing ships are today," recently stated Lord Kysant, who directs Harland & Wolff and more than 2,000,000 gross tons of shipping under the flags of the Royal Mail Steam Packet Co. and associated lines.

Fairfield's is one of the busiest yards on the Clyde. They have in hand a 20,000 ton motorship for the Shaw, Savill & Albion Co. and two large motorships for the Bibby Line. All these vessels will have Fairfield-Sulzer engines of the same type as in the transpacific motorliner AORANGI.

### Fast Motorships Oust Steamers.

SANTOS MARU, MONTEVIDEO MARU, and LA PLATA MARU, three 7000 ton dead-weight motorships owned by Osaka Shosen Kabushiki Kaisha, are demonstrating the superiority of the fast, well-equipped motorship over the steamer on the run between the South American coffee ports of Santos and Buenos Aires and New Orleans. This they do in 15½ days as compared with the 22 days taken by steamers. Moreover these ships are said to be operating at a 40 cents per hundred rate, just half of the tariff charged several months ago, before the Lloyd Brasileiro, which is controlled by the Brazilian government, withdrew from the Northbound Brazil Freight Rate Conference. This withdrawal was due to dissatisfaction over the amount of coffee carried by the fast Munson and Lamport & Holt liners, and the Lloyd Brasileiro signed contracts for 1926 to carry coffee for 40 cents per hundred. The Japanese company with its three fast and economical motorships is also carrying coffee at this low rate. The three ships are 430 ft. between perpendiculars and have a dead-weight of 7200 tons. Accommodation is provided for 40 first-class, 110 third class and about 600 emigrant passengers. Speed on service is 14 knots, secured by two 6-cylinder Sulzer Diesels developing collectively 4600 b.h.p. at 112 r.p.m., with independently driven scavenge blowers.

### United States and Submarines.

"Our present attitude towards submarines is not clearly defined," stated the *New York Times* last month in the course of an analysis by Richard V. Oulahan, its Washington correspondent, of the problems to be taken up at the preliminary meeting of the Powers at Geneva, Switzerland, to prepare for a world conference on the reduction and limitation of armaments. The article continued: "In the Washington Conference Great Britain proposed the abolition of submarines. France, Italy and Japan objected. The United States proposed a limitation of 60,000 tons each for Britain and the United States, about one-half that for France and Japan, and about one-third for Italy. Japan and France opposed this."

"The American delegates were urged by their naval advisers to oppose the British proposal. The American Advisory Committee of Twenty-one, appointed by President Harding, also wrote an opposing opinion which, says the delegation's official report, 'was presented by the American delegation as setting forth in a succinct manner the position of their Government.'"

"The retention of a large submarine force may at some future time result in the United States holding its outlying possessions," said the Advisory Committee.

"The White House let it be known informally recently that while President Coolidge did not care to say that the Government would not change its Washington Conference submarine attitude, it should be made clear that the former policy was his policy now, but that he had an open mind to hear and consider any and all recommendations for submarine abolition."

"So discussion of submarine abolition in a disarmament conference promises interesting possibilities affecting American participation in it."

# Application of Rotors to Motorvessels

Rotors are to be Regarded as Auxiliary to Engine Power and  
Only as a Means of Economy in Operation.

By Anton Flettner

(BADEN-BADEN, *ex* BUCKAU, the pioneer rotorship, arrived in New York on May 10, having crossed the Atlantic in 37 days, and Mr. Flettner, the inventor of the rotor, has come over to the United States to demonstrate her. MOTORSHIP invited Mr. Flettner to outline the economies of the rotor principle in the light of the experience gained with the BADEN-BADEN, and he responded with the following contribution, which is substantially an extract of the address he gave to the American Steamship Owners' Association in New York, May 17.)

A ROTORSHIP as such needs no propeller and only a small engine to revolve the rotors, the power required for the drive being about 9 per cent of the power given to the ship from the wind by the rotors.

It never has been my pretension that rotorships should depend on wind power alone. Every rotorship, except a pleasure yacht, should have a main engine and screw propeller, the power of the main engine not being less than that of a normal motorship or steamer.

A rotorship in a dead calm will travel at the same speed as the corresponding power vessel of the ordinary type. When there is a fair breeze the rotorship will travel faster than the ordinary vessel, due to the combination of screw propeller and rotor power. In strong winds she may use the rotors only and make better speed than motorships or steamers which lose speed in the heavy sea kicked up by a high wind. The net result is that the average speed of the rotorship is higher than that of the ordinary power vessel.

The average fuel consumption will be considerably less. Let us assume a 10,000 ton ship with 3000 hp. and of 10 knots speed. If the engines are throttled to three-quarters power, or 2250 hp., the speed of the ship will be reduced from 10 knots to about  $8\frac{1}{2}$  or 9 knots. In a strong wind the rotors will produce the equivalent of say 1500 hp. or 2000 hp. If during 50 per cent of the voyage the rotor power and propeller power are combined, the ship will make 11-11½ knots during that period. In the other half of the time the speed can be assumed at  $8\frac{1}{2}$ -9 knots on reduced engine power. The average for the whole voyage will then be 10 knots, the same as it would have been if full engine power alone had been maintained all the time. It must not be forgotten, however, that on a long passage the ordinary powership cannot maintain its normal speed on account of wind and sea conditions, hence the rotorship with only 75 per cent of the power of a motorship or steamer will be superior in average speed, with a saving in fuel amounting to 25 per cent and possibly more because when the propeller and the rotors work together the engine may be throttled down.

Part of the cost of installation of the rotors is compensated by the saving in the engine investment and the rest by the sav-

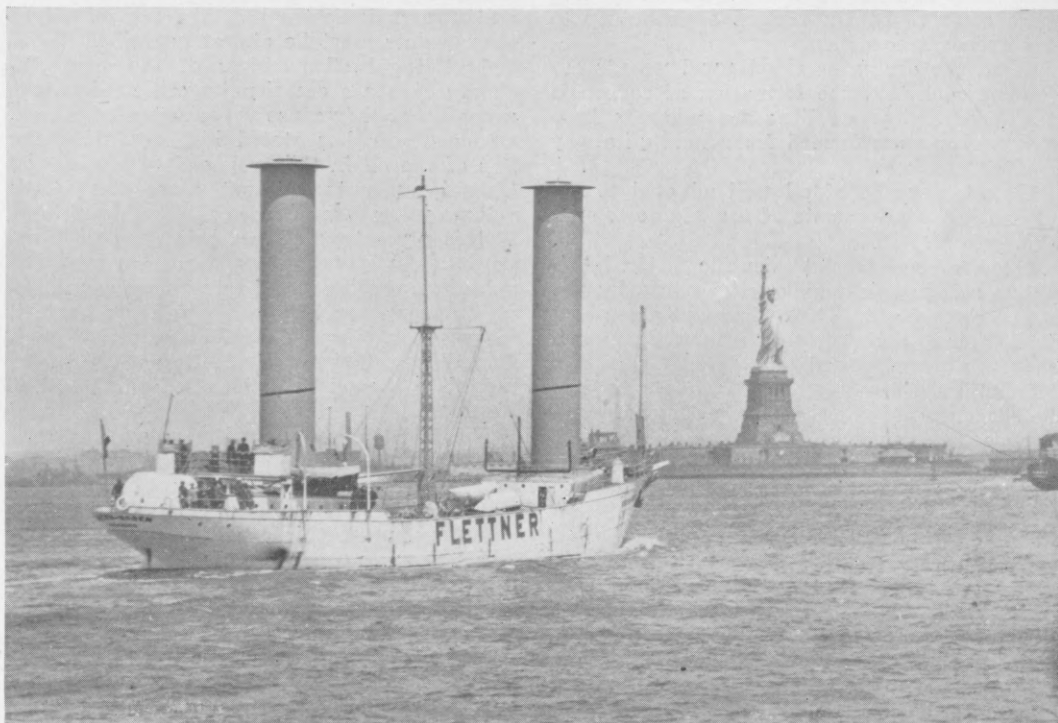
ing in fuel. In less than one year the total cost of the rotor installation should be recouped. Additional advantages are greater safety, because the rotors are available in case of engine or propeller trouble, and the rotorship is also more stable in heavy weather because the wind braces it the same as a sailing ship.

Deck space is not reduced by the rotors because they are mounted on the regular superstructure. On the 3000 tons ship BARBARA, launched in Germany a few weeks ago, one rotor is mounted above the bridge, one on the superstructure amidships and the third on the after deck where the pivot

under her own power whenever necessary. Her speed would not be very high under rotor power, because a comparatively small rotor probably would be found sufficient, but still it would greatly reduce cost of towing.

The question will suggest itself how the rotor is to be installed on existing vessels, where the building in of the pivot would be awkward or require extensive alterations. For this case we have designed an arrangement which permits the installation of the rotors without any structural changes and which is comparatively inexpensive.

It has been objected that ice would form on the rotors and prevent their operation.



*Baden-Baden, the rotorship that crossed the Atlantic, arrives in New York*

causes no obstruction at all. The BARBARA, which is 300 ft. long, has three rotors 55 ft. high and 13 ft. diameter. In her case we have attacked the problem in a different manner. We gave the engines 1000 hp., and the rotors will develop the equivalent of about 1200 hp. Without rotors the ship is guaranteed to make 10 knots. The intention is to throttle the engine when there is wind, and the result will be that this vessel will make a higher average speed and yet burn less fuel.

It has been suggested that coast barges would provide a particularly attractive field of application for rotors. There is no reason that I can see why such installations should not be extremely simple and why the type of men who handle these barges should not be able to operate the rotors without any difficulty. For the drive I would recommend a simple oil engine of the marine type with clutch and transmission gear box, including of course, reverse gearing. A tow barge equipped with one rotor could travel

This danger does not exist, because any ice which may form on the rotor cylinder will be thrown off by centrifugal force. In a sleet storm we keep the rotors continually turning to prevent any accumulation of ice.

When one considers that each of the rotors on the BADEN-BADEN does not require more than 9 hp. for its drive, one will understand that the power problem is a very simple one.

On account of the large dimensions of the rotor, people imagine that the rotorship must be topheavy. The fact is, however, that the weight of the rotors is only one-tenth that of the sails, masts and tackle which they replace and that the center of gravity is lower. While the normal tackle including the sails on a 3000 tons sailing ship weighs more than 200 tons, the rotating part of one rotor on the 3000 tons BARBARA weighs only  $1\frac{1}{2}$  tons. No addition to the crew is required, when rotors are added to the equipment of a motorship or steamer.

# Oiling Lessons from the East Indian

Why the Lubricating Oil Is Bright and Clear After Vessel  
Has Traveled About 20,000 Miles

WHEN the EAST INDIAN, latest addition to the fleet of vessels which carry products of the Ford Motor Company overseas, returned to New York in April, she had rounded out some 20,000 miles, and yet the lubricating oil in the crankpits of the two 2500 s.hp. Sun-Doxford engines was regarded by the engineers as being in a condition superior to the original. Of course, there is no physical proof that the opinion of the engineers was right, but they were very positive in the belief. A sample of oil dipped from the crankpits would show a slight trace of carbon and of moisture after standing, but a sample taken from the clean oil spout of one of the two purifiers used to keep the oil in condition did not contain such impurities visible to the naked eye.

In the matter of clean lubricating oil this Ford ship establishes a high standard, and there seem to be six factors contributing to this excellent condition.

First, the design of the EAST INDIAN's engines is such that the formation of carbon is minimized and precautions are taken to keep such carbon as is formed from finding its way into the crankcase.

Second, a grade of oil well adapted to the lubricating requirements of the engine is used (Vacuum D. T. E.).

Third, a sensible and scientific piston lubricating schedule is rigidly adhered to by the engine room force. The pistons are given just enough oil to maintain a thin, protective film. They are never flooded.

Fourth, the use of oil purifiers (De Laval), the efficiency of which is clearly demonstrated, because, regardless of how small the amount of carbon or other dirt which gets into the oil may be, one would suppose that there would be a sufficient quantity of it to discolor the oil after 20,000 miles, whereas actually the oil had a bright color.

Fifth, the centrifuging of the fuel oil to purify it.

Sixth, the eagerness of the engineers to make the best showing ever made.

The EAST INDIAN's engines follow the usual Sun-Doxford design, operating on the 2-cycle system with opposed pistons, each upper piston driving through twin rod mechanisms to twin cranks at 180 deg. to the center crank on which the drive from the lower piston is taken. Actually these engines do not belong to the Diesel class, being characterized by a much lower compression. They are not, however, surface ignition engines. They seem to belong to a distinct class of their own. The engines have four power cylinders of 21.26 in. diameter and a total stroke of 85.04 in., with a scavenging pump direct-connected to the crankshaft in the middle of the engine.

A forced feed system of lubrication is used for the main bearings, crankpin bearings, cross-head guides and pad thrust block, the oil being supplied at a pressure of 30 lb. per sq. in. There are about 400 gal. of oil in the lubricating system of each engine, and each engine has its own De Laval oil purifier, but these machines are so connected that it is possible for one of them to handle the oil from both engines and that is the practice employed, it having been found that one purifier has ample capacity to keep the oil in the condition noted in the beginning of this article.

The oil is purified at its working temperature and at the rate of approximately 225 gal. per hr., one or other of the lubricating oil purifiers operating throughout the entire 24 hr.

This means that the entire quantity of lubricating oil in use is purified six or seven times a day.

For cylinder lubrication Manzel oilers are used. There are six feeding points in the part of the cylinder swept by the upper and six points below for the lower piston. Each cylinder is therefore provided with two 6-point lubricators, making a total of eight lubricators for the power cylinders on each engine. There is an extra lubricator for the scavenge air pump.

Eight gallons of new oil are used each day to lubricate the pistons of the two engines, and whatever quantity of this oil drips into the crankpits represents the only make-up oil added to the entire lubricating system.

This is a point worthy of note from two angles. It means that the carbonization of lubricating oil in the engine is extremely low, and also it indicates that the loss of oil at other points must be almost negligible.

Centrifugal oil purifiers of the open discharge type are occasionally criticized on the ground that they cause vaporization of the oil. One engineer has stated his belief that the loss of the oil in this way and by leakage on his ship amounts to about 2 per cent of the volume going through the centrifugal machine. If this percentage of loss held good with regard to the EAST INDIAN, somewhat over 100 gal. of oil per day would be required for make-up, because over 5000 gal. of oil are handled every 24 hr. through the lubricating oil purifiers. The criticism is evidently not valid with regard to the purifiers installed on the EAST INDIAN.

The fact that only 8 gal. of new oil is used daily by the two engines of the EAST INDIAN proves that the film of oil maintained in the pistons is very thin. Were carbon or other impurities present in large quantities in the lubricating system a heavier oil film would undoubtedly be employed, because any large particles present would easily penetrate the oil film and result in excessive wear and perhaps in scoring of the pistons and cylinder liners. Thus it may be stated that the proper purification of oil makes it entirely practical, as it is from the economical standpoint desirable, to operate the EAST INDIAN's engines with but a thin oil film. On the other hand, the very fact that the film of oil is kept as thin as possible aids materially in obtaining a high degree of purification. When an excessive amount of oil is used a large part will be burned in the combustion chamber, and an appreciable percentage of the carbon residue will find its way into the crankcase.

How much carbon gets into the crankpits of the EAST INDIAN's engines it is impossible to say. The pistons are of the water-cooled type, and, as is almost always the case when water-cooled pistons are used, a certain amount of water finds its way into the lubricating system. In one sense this is an advantage because the water is almost immediately centrifuged out of the oil by the purifiers, carrying with it a large amount of light solids which would otherwise be retained in the bowl of the purifier.

Somewhere in the neighborhood of a gallon of dirt is removed from the lubricating oil purifiers each time they are cleaned and a lot goes out through the water discharge spouts of the machines. That this quantity of impurities must represent almost 100 per cent of those which get into the oil is found in the fact that after 20,000 miles the red lead in the

bottom of the crankpit looks as though it had just been put on. When a finger is rubbed over a bearing or crankshaft it comes away oily but not black.

Purification of the fuel oil has been given as a fifth reason for the comparative absence of dirt in the lubricating oil of the EAST INDIAN. Considerable stress has been put on the advantage of using a thin lubricating film on the pistons in order to reduce burning of the oil and blowing back into the crankcase of the carbon so formed. Carbon at its worst can scarcely compare with the dirt contained in most fuel oil when it comes to breaking the film of protection between piston and cylinder walls or the consequent damage to the engine. The two fuel oil purifiers (also De Laval, but of the vapor-tight type) installed on the EAST INDIAN are an insurance against the entrance of abrasive material into the engines. These two machines are fitted with gasketed cast aluminum covers and closed flexible hose connections at inlet and outlet points, so that the oil can be easily purified at temperatures above its flashpoint. They are connected in parallel and are operated about 7 hr. daily, during which time they purify about 16 tons of fuel oil used for all purposes in an average day's run. From this quantity of fuel they remove nearly two buckets of dirt and a considerable quantity of water.

That the first five reasons would be inadequate to achieve the results recorded if the sixth reason were to lapse is self-evident. Capable and earnest engineers are essential to success. A knowledge of what those men accomplish affords guidance and encouragement to the younger men.

Bids for the construction and delivery at Albany, N. Y., of a Diesel engined towboat for the Bureau of Canals, Department of Public Works, State of New York, were received last month by Thomas F. Farrell, Commissioner of Canals and Waterways. Bethlehem S. B. Corp. submitted a bid for \$55,000 and Todd Drydock & Eng. Corp. quoted a price of \$63,063. The proposals were rejected and new bids are to be invited, but the reason for this step has not been announced.

## Catalogs.

*Marine Oil Engines for Direct & Electric Drive.* A 21-page booklet describing the application of the Ingersoll-Rand engine to towboats, ferries and tankers, both with direct and electric drive. Discusses also the principal features of the engine. Ingersoll-Rand Company, 11 Broadway, New York.

*Standard Electric Ranges.* Catalog No. 14. 32 pages. Descriptive illustrated list of electric ranges, ovens, cookers, hot plates, urns, serving tables, griddles, and water heaters. The Standard Electric Stove Co., Toledo, Ohio.

*Brown Pyrometers.* Catalog No. 15. 80 pages. Illustrated description and pricelist of pyrometers, thermocouple protecting tubes, switches and other accessories. The Brown Instrument Co., Philadelphia, Pa.

*The Maxim Industrial Silencer.* Illustrated folder descriptive of a device for quieting air, steam and gas noises from exhaust intakes or discharges. The Maxim Silencer Co., Hartford, Conn.

# Recent Technical Reports and Addresses

## A Review of the Principal Monographs on Motorships, Marine Oil Engines and Associated Subjects

### High Powered Oil Engines

By W. S. Burn, M.Sc. Published by the North East Coast Institution of Engineers and Shipbuilders, Newcastle, England.

In this paper W. S. Burn, Diesel engineer to Richardsons, Westgarth & Co., discusses a new type of double-acting 2-cycle engine with airless injection he has designed for his firm. Unfortunately, no test data are available of the single-cylinder unit upon which experimental work has been carried out, so that it is impossible to form any idea of the performance of this engine in comparison with other similar types. The inevitable diagrams of weight and space taken up by single-acting 4-cycle and 2-cycle, double-acting 4-cycle and 2-cycle and opposed piston engines are included. It is of interest to note that the Richardsons, Westgarth single-cylinder experimental unit has been made for incorporation in a 4-cylinder engine, with cylinder diameter of 26¼ in. and 47¼ in. stroke. At 90 r.p.m. the engine will develop 800 b.h.p. per cylinder or 1110 b.h.p. per cylinder at 125 r.p.m. It is to be built in powers up to 10,000 s.h.p., a 9-cylinder engine being required for this power.

### Hydro-Mechanical Marine Gearing

By James Richardson, B.Sc. Published by the North East Coast Institution of Engineers and Shipbuilders, Newcastle, England.

Mr. Richardson has done well to call the attention of marine engineers to the advantages of indirect drive in general and of hydraulic drive in particular. Opinion in this country has always been alive to the possibilities of a drive other than direct to the propeller shaft and it has realized the necessity of incorporating some form of flexible coupling in the system. The British, with native conservatism, have never really taken notice of any form of Diesel drive other than direct drive, while Germany has always foreseen the possibilities of indirect drive and more particularly of the hydraulic system. It is unique to find a British marine engineer taking up the question of hydraulic drive in such a wholehearted manner as Mr. Richardson does. The particular type of transmission he discusses is the drive through hydraulic clutches on Dr. Föttinger's system, adapted for marine work by Dr. Bauer and the Vulcan Werke. (This method of operation through hydraulic clutches was dealt with fully in MOTORSHIP for February, 1924.) The "coiled spring" action of the lubricating oil in the driving clutch is fully discussed by the author of this paper, and so are the advantages of being able to control maneuvering on the clutches without reversing the main engines—advantages which towboat owners would do well to consider. Some tests carried out at the University of Hanover with a Diesel engine and clutch revealed the fact that any torsional oscillations in either the engine or the shaft are damped out by the clutch. An interesting arrangement of Föttinger hydraulic clutches in conjunction with two double-acting 4-cycle reversing engines driving a single shaft is perhaps the most constructive part of the paper. This arrangement which, we believe, is being fitted to the ex-turbo-electric WULSTY CASTLE and which has a total of 1600 b.h.p. at the propeller shaft is compared in size with a single-acting 4-cycle engine of the same power. The former has an overall length of 30 ft. 6 in. and

a weight of 40 tons. The latter has an overall length of 40 ft. 3 in. and a weight of 210 tons.

### Temperature Variations and Heat Stresses in Diesel Engines

By Robert Sulzer. Published by the Institution of Naval Architects, London, England.

One of the greatest aids to the Diesel engine designer is the possibility of being able to calculate the heat stresses, in order that due allowance may be made for them in the design of cylinders, cylinder covers and pistons. In order that such stresses be determined a knowledge of their distribution is necessary.

The temperature of the gases, which may have a periodic variation of more than 1000 deg. C., causes a variable distribution of temperature in the cylinder walls. Mr. Sulzer brings out the interesting fact that although there is such a big fluctuation in the gas temperature curve, the temperature fluctuations in the surface of the cylinder metal on the gas side varies only a few degrees. On a surface in contact with the gases the temperature varies periodically about a mean value, but only by about 14 deg. C. above and 8 deg. C. below, in spite of the big range in gas temperature during each revolution of the engine. Inside the walls the temperature variation dies down rapidly and at a depth of about 2 in. it is less than ½ deg. C.

Accurate calculation of temperature distribution in cylinder walls is only possible for castings that are not too complicated, Mr. Sulzer considers. He illustrates a system of isotherms which he obtained for a water-cooled cone-shaped cylinder cover with only one centrally arranged opening for the combined fuel and starting air valves. Furthermore, he states, heat stresses corresponding to the distribution of the constant temperature can only be submitted to a strict calculation when the axial symmetry of piston, cover and liner is not too much broken by valves and ribs. For this reason he considers that accurate estimation of temperature distribution in a 4-cycle cylinder cover is difficult. A valuable series of tests to determine the distribution of temperature in the walls of the cylinder liner, cover and piston of a Sulzer engine is discussed and the results are shown graphically.

### Comparative Freight Economics of a Cargo Vessel with Reciprocating and with Diesel Machinery

By W. J. Lovett. Published by the Institution of Naval Architects, London, England.

In this analysis the author sets out to compare the results of a year's trading of a steamer for varying lengths of voyages and with varying cargoes. A similar comparison is made for the same hull fitted with Diesel machinery, purporting to show that the freight economics of the two types can be balanced up alongside each other. These results are disappointingly inconclusive. For example, we are told there is an economical speed for all lengths of voyage and not necessarily the slowest speed. It is higher in the motorship than in the steamer. In view of this, it is difficult to understand why the ordinary service speed of both motorship and steamer is considered at the outset as under 10 knots, while the maximum speed at 2400 i.h.p. is taken as 11 knots. The present tendency is to design cargo carrying motorships

of 8000 tons gross deadweight (the author's figure) and over with service speeds of 13 and 14 knots. In this particular analysis, the motorship is considered as having all-steam auxiliaries, which further tend to detract from economical operation. The steamer too is of the most conservative type with coal-fired non-superheat boilers and reciprocating engines. The assumption is also made, in comparing the steamer and the motorship, that the latter is considered as a steamer with the steam plant removed and with the Diesel plant substituted. Consequently, both are considered to have the same dimensions, the somewhat fine block-coefficient of 0.775 being associated with the 10 knot speed. It is conceivable that a motorship with 8000 tons gross deadweight and 10 knots speed might have a different hull form from the steamer and in all probability smaller dimensions.

There is a certain amount of useful operative data in Mr. Lovett's paper, but we feel that nothing new or constructive is adduced. It is a definitely established fact that the motorship is more economical than the steamer in a large and increasing number of routes. No deep analysis such as the author attempts is now necessary to prove it.

### The High Efficiency Oil Engine

By Alan E. L. Chorlton. Published by the North East Coast Institution of Engineers and Shipbuilders, Newcastle, England.

Exploring the field of improvement in efficiency of the oil engine, the author, who is intimately connected with the design of Beardmore oil engines, suggests that the constant volume cycle is now worthy of designers' serious attention. Practical difficulties in the development of this cycle, he considers, have appeared to limit construction to a certain maximum compression ratio.

The main line of development in the improvement of the efficiency of the internal combustion engine, however, has always been the increase of the compression or expansion ratio, and Mr. Chorlton indicates that further progress in this direction is still possible. If the mechanical efficiency is to be raised, design will have to follow the line of automobile, or aero engine practice and employ higher speeds, smaller pistons, fewer rings, etc. Gains due to such alterations from standard practice are, however, offset by an increase of fluid piston due to the higher rubbing speed of the piston.

The investigation indicates that the avenue of advance in the direction of higher efficiencies is largely connected with the use of pressure lubrication. This is an absolute necessity for an engine running at higher speeds. The total saving made by the greatest care in this, and in matters mentioned above such as smaller pistons, etc., the author considers, should succeed in the end in obtaining a mechanical efficiency of as much as 90 per cent under favorable conditions.

The paper goes on to discuss design of small high speed Diesel engines, ruling out the employment of air injection of fuel for such engines both on the grounds of cost and weight.

Finally, the author gives a description of a high speed engine manufactured by Beardmore & Co. and of preliminary tests carried out with this engine. In one of these tests, of three hours' duration, 424 b.h.p. was developed at 1007 r.p.m., with a consumption of 0.365 lb. of Shell-Mex Diesel oil per b.h.p.-hr.

## New Balanced Reaction Rudder

**A**N adaptation of the ordinary single plate rudder as a contra propeller, the plates being curved to give a propulsive effect due to the rotation in the screw race, has been patented by John Tutin, M. Sc., naval architect of Sunderland, England, who claims that it improves the propulsion of the ship and gives a high degree of balance. The balance is obtained by extending the plates and rudder arms forward of the center line of the pintles. Curvature of the plate and the general arrangement of the rudder are shown in the drawing on this page. The rudder can be put hard over to 48 deg. on either side of the center line without plates or arms fouling the stern post or propeller blades.

Construction varies from that of an ordinary single plate rudder in the fact that the "plate" is actually composed of three plates, the topmost of which is fixed in the ordinary way, while the bottom two are rolled concave to the centerline of the ship on port and starboard hands alternately, the rudder arm being correspondingly curved. This is incorporated with the usual arrangement of gudgeons and pintles. The design has been formally approved by Lloyds Register and British Corporation, and the approval of Bureau Veritas and Norske Veritas is pending.

The inventor claims for his rudder the saving of fuel consumption due to increased thrust usual with the contra propeller and claims equal advantage without the projecting blades of the contra propeller which may become damaged under certain conditions of operation. Also there is no welding, no interference with the removal of the propeller

and the plates can easily be rolled to the correct curvature. On figures supplied by the inventor there is a very definite saving of weight over the ordinary single plate rudder. This is shown in the following comparison of rudders for a ship 455 ft. by 58 ft. by 37 ft., 12 knots speed and 178.4 sq. ft. rudder area.

### Comparative weights of rudders

PART OF RUDDER	ORDINARY	BALANCED REACTION.
Plate .....	3.77 tons	2.85 tons
Arms .....	5.42 tons	2.69 tons
Main piece .....	5.15 tons	2.62 tons
Upper stock .....	2.41 tons	1.32 tons
Pintles and nuts.....	0.95 tons	0.52 tons
Rudder and stock ....	17.70 tons	10.00 tons
Tiller and quadrant ..	4.82 tons	2.38 tons
Total	22.52 tons	12.38 tons

This shows a saving of 10.17 tons or 45 per cent in favor of the balanced reaction rudder as compared with the ordinary single plate rudder. With the same rudder, the center of pressure of the whole area, assuming the center of pressure of each element of area to be at three-eighths of the breadth from its leading edge, is 1.61 in. abaft the center line of the pintles. The corresponding distance for the single plate rudder is 4.36 in. From this, a reduction of torque of about 63 per cent may be calculated, which means that the

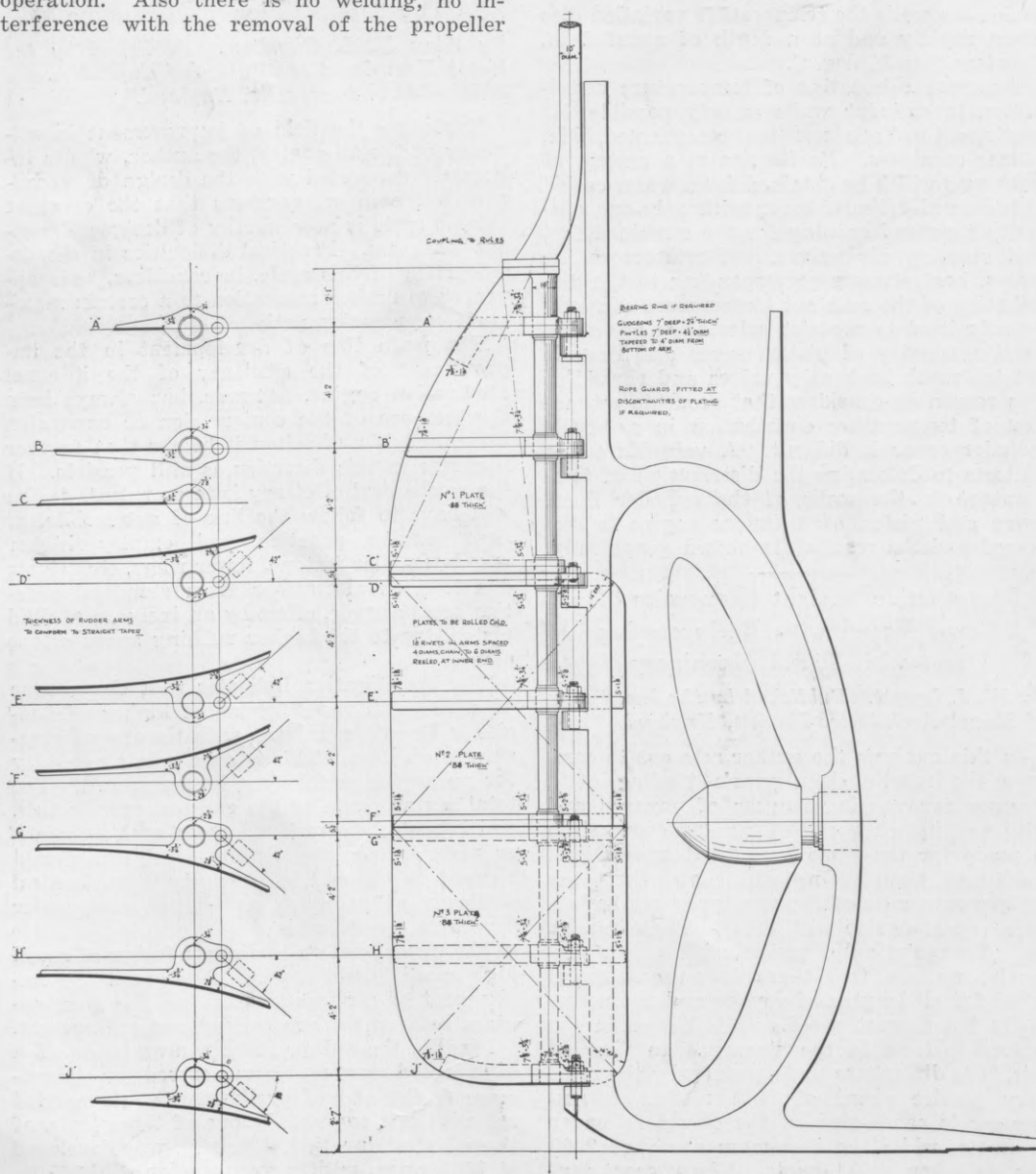
power required to operate the balanced reaction rudder is about 60 per cent less than with the ordinary single plate rudder, an important saving from the motorship operator's point of view.

With the ship running astern, the effect of the rudder on the screws is to reduce the thrust slightly at given r.p.m. The initial "twist" given to the water then corresponds to a virtual reduction in the apparent r.p.m. At the same time, however, the torque is also reduced, and the screw will therefore tend to turn more rapidly for a given astern s.h.p.

### Personal

Peter A. Sensenig has joined the publicity staff of the Ingersoll-Rand Company, 11 Broadway, New York, and will specialize on the I-R oil engines for marine, locomotive and stationary service. Mr. Sensenig was previously employed for eight years in the Westinghouse Department of Publicity and was located at East Pittsburgh, Atlanta, Philadelphia and New York. He was chairman of the Exhibits Committee of the American Marine Exposition held last November in New York and is a member of the Propeller Club, Poor Richard Club, N. Y. Maritime Exchange and American Society of Port Authorities.

Announcing a consulting and advisory service on oil engines and marine installations, J. Barraja-Frauenfelder & Co. classifies the main branches of its service as research and design, manufacturing advice, torsional vibration investigation, marine power plants, propeller research and design, appraisals, estimates, opinions and legal testimony. The staff consists of a senior advisory engineer, Rear-Admiral Charles W. Dyson, U. S. N. (ret.) lately Inspector-General, U. S. Navy Dept., and a financial adviser, W. V. Naulty of Naulty & Co. in addition to the following executive staff:—J. Barraja-Frauenfelder, formerly chief engineer of the submarine department, Fiat San Giorgio, Spezia, Italy, and chief engineer, The Lake Torpedo Boat Co., now consulting engineer for Sun Shipbuilding & Dry Dock Co., Pacific Diesel Engine Co., and others; Heinrich Schneider, consulting engineer to American Locomotive Company, formerly chief engineer of the Swiss Locomotive and Machine Works of Winterthur, Switzerland, and designing engineer with the Vulcan Works in Hamburg, Germany, etc.; Edward C. Magdeburger, aide on Diesel Engines, Bureau of Engineering, Navy Department, formerly designing engineer with Busch-Sulzer Bros. Diesel Engine Co., Fairbanks-Morse Co., Allis Chalmers Co., etc.; H. H. Wilkinson, electrical engineer, formerly assistant chief electrical engineer with Lake Torpedo Boat Co.; and Roger A. McShea of R. A. McShea & Co., public accountants.



Balanced reaction rudder—a combination of the contra propeller principle with a rudder

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